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Posttraumatic Stress Disorder in Mineworkers

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To the miner,
who has shown me what it is to work, what it is to give, what it is to
appreciate, what it is to be with your family and,
what it is to be!

POSTTRAUMATIC STRESS DISORDER IN MINeworkERS

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CHAPTER 1: INTRODUCTION

1. STATEMENT OF THE PROBLEM

Most of the traumatology literature is dominated by Western-orientated conceptions of mental health (Figley, 1995). According to Westermeyer (1995) many mental health professionals shy away from assessing and treating patients from different cultural and linguistic backgrounds, with some referring to it as impossible. Westermeyer claims that for it to become feasible, mental health professionals must acquire knowledge, skills and experience (preferably supervised) in conducting this type of work.

Most cross-cultural posttraumatic stress disorder (PTSD) studies that have been reported were done on Indochinese refugees (Cheung, 1993; Kinzie, Boehnlein, Leung, Moore, Riley, & Smith, 1990; Moore & Boehnlein, 1991). An extended literature search on PTSD in the South African mining industry (Easton, 1988; Ericksson, 1995; White, 1982) has delivered limited results, in spite of the high incidence of traumatic accidents in this industry. Although little doubt actually exists - based on the number of scientific reports on PTSD - about the validity of PTSD as a consequence to traumatic life events, the true constellation of symptoms of gold mineworkers after mine accidents in South Africa still needs to be investigated and empirically verified. This absence of scientific facts on the prevalence and nature of PTSD in the gold mining industry hampers the efforts of mental health clinicians to motivate the implementation of preventative and rehabilitation policies and programs to mine management.

Mental health professionals in the mining industry experience ethical conflicts between serving the interests of the organization and serving those of the employee. A study on the history of PTSD has shown that typical problems have

also been experienced by Spiegel and Grinker in the treatment of soldiers (in Jones, 1987, p.811). Grinker, Spiegel and Levy outlined this philosophical and ethical dilemma experienced by physicians during war as follows (in Jones, 1987, p.811):

Whereas, in peace, our role is to ally ourselves with the best interests of individual patients ..., in war, the mission of the Armed Services demands that we revise our role - allying ourselves with the primary aim of preserving the fighting force, at times in ways which we perceive as counter to the best interests of the individual patients that we treat.

According to White (1982) the gold mining industry in South Africa is in many ways similar to a military situation. Pressure exists to rehabilitate the victims of mine accidents as fast as possible so as to ensure continuation of maximum production and to avoid unnecessary costs.

The new Compensation for Occupational Injuries and Diseases Act Number 130 of 1993 (Government Gazette of the Republic of South Africa, 1993) does not provide legislative procedures on which high-risk organizations like the gold mining industry could measure their response policies and procedures in respect of emotional trauma. This could be a contributing factor for the absence of formal policies, in many gold mines, for employees found unfit for work as a result of the psychological consequences of trauma. This is to the disadvantage of both the clinician and the employee. Clinicians have limited options when employees are unfit for underground work due to PTSD. The majority of them could face repatriation. The employee who may have served most of his productive life in the gold mines may find himself without a future if he is unable to return to the underground environment due to PTSD. The consequent repatriation therefore creates a situation in which an employee with many years of loyal service has to

leave the mine without any compensation benefits and then face subsequent unemployment, even if the primary reason for his leaving was the exposure to mine trauma. The clinician as a result also often experiences conflict in declaring the employee unfit for work due to PTSD. Because of the ongoing restructuring within the gold mining industry to adjust to the ongoing drop in the gold price, transfer options to other employment areas are limited.

Scientifically based information on the symptoms and signs, on the validity and on the etiology of the posttraumatic stress syndrome in employees of the mining industry could provide data on which policies for the management of traumatized mine employees, and also employees in general, could be developed. Research into PTSD in the gold mines would also address the huge vacuum in terms of scientific research on PTSD in non-Western populations, especially in terms of research in Southern Africa.

2. AIM OF THE STUDY

The aim of the study was to investigate:

1. the character of the signs and symptoms of PTSD in mine employees in terms of the criteria of the Fourth Edition of the Diagnostic and Statistical Manual of Mental disorders (DSM-IV) for PTSD (APA, 1994); and
2. the pathogenesis of PTSD in the mine-worker.

CHAPTER 2: GOLD MINING IN SOUTH AFRICA

1. INTRODUCTION

The history of man's interest in the acquisition of gold extends over roughly 6000 years, dating from the paleolithic man. The first written historical reference to the mining of gold dates from the Sixth Dynasty (c.2625 - 2475 B.C.) in Egypt (Bratton, 1967; Singer, 1954). The earliest reference to the discovery of gold in South Africa, subsequent to the Dutch colonization in 1652, is that of Sir John Barrow who claimed to have found gold in the Orange River during his travels in 1801 to 1802. From the earliest days the country north of the Vaal River was reputed to be rich in minerals (Rosenthal, 1970).

When P.J. Marais discovered gold in the Jukskei River during 1853 the stage was set for further developments in this field and the discovery of small quantities of gold was reported over a period of years. By August, 1886, the Main Reef had been opened up in a number of areas ranging from Germiston to Roodepoort. The area between Randfontein and Klerksdorp was opened up in 1932, the Orange Free State Goldfields in 1947, and the Evander area in the Eastern Transvaal in 1950 (Mauer, 1972).

The aim of this chapter is to provide a background of mining circumstances in South Africa against which the PTSD phenomena are to be regarded.

2. THE EXTENT OF THE SOUTH AFRICAN GOLD MINE INDUSTRY

At present there are 53 producing gold mines in South Africa. The South African economy is heavily dependent on the strength of the gold mining contribution. When the gold price is low the economy sinks into a recession, and when the gold

price is high there is an economic boom. In 1996, the mining industry continued to contribute substantially to the national economy, both in terms of contribution to foreign exchange earnings and to the gross domestic product (GDP) of South Africa. Although the relative importance of gold mining has declined somewhat over the last decade in line with fluctuations in the gold price, gold mining still directly contributes almost 4% to the GDP (Chamber of Mines of South Africa, 1996).

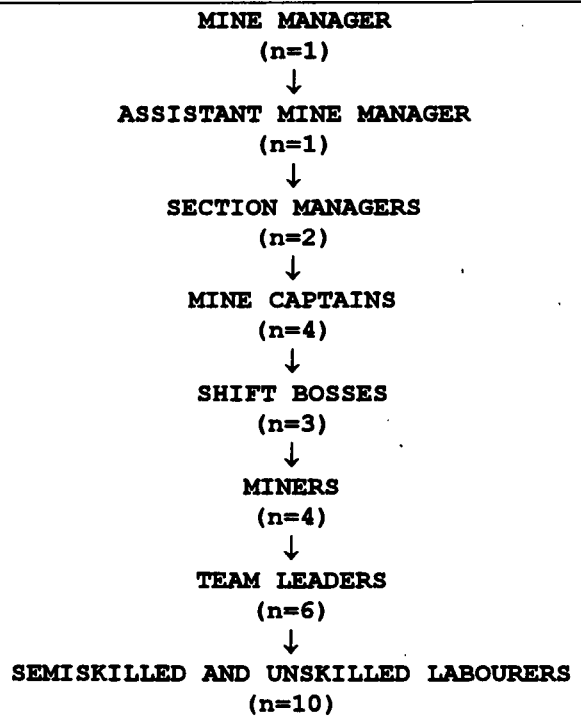
During 1996 South Africa was ranked first in terms of the world's gold reserve base (that is those resources that are currently economic and marginally economic) and this represents 40% of the world gold reserve base. South Africa produced 21.1% of the World's gold during 1996 (Chamber of Mines of South Africa, 1996).

The significance of the industry to the South African labour market can best be judged from the labour force employed by it. In 1996, the mining sector provided employment opportunities to an average of 546 475 workers, representing approximately 3,5% of the country's economically active population. Of this figure 63.1% were employed in the gold mining sector (Chamber of Mines of South Africa, 1996). During 1997 an average of 294604 employees were at work in the South African gold mines (this includes establishment as well as contract workers). Approximately 233321 (80%) were employed underground (Department of Minerals and Energy, 1998). It is this underground population that is the main subject of this study, for it is these underground workers who are exposed to all the physical and environmental stressors endemic to the industry.

Each mine is usually managed by a single individual directly responsible to the board of directors of that mine. This manager often has an assistant. Below this level the structure is usually divided into five large areas related to the

functions of the employees in the overall operation. These areas are mining, recovery operations, engineering, safety and health, and administration. The Mines and Works Act prescribes the functions of the individuals at each level and their legal responsibilities to a considerable extent. In addition to these areas each mine has a number of other service departments, inter alia surveying, geology, ventilation, and personnel.

The organizational structure of the mining department of a typical gold mine is presented in simplified form in figure 1. The unskilled labourers and certain specialized semi-skilled individuals occupy the bottom of the organizational structure of the mining department. In the mining environment the unskilled labourers are known as mining assistants and the semi-skilled individuals are drillers/machine operators, loco drivers, winch drivers, loader drivers, etc. The team leader occupies the first level of supervision above these unskilled and semi-skilled labourers. The number of team leaders in a gang varies, but on the average the ratio is roughly 1 : 10.



The n's indicate the approximate numbers of people subordinate to each person in the level above.

Figure 1 Mining department organizational structure (simplified).

The team leader directly assists the miner in the supervision of labour. The team leader finds himself in a situation in which he has to interpret the instructions of his superior, relay them to his subordinates and ensure that they are carried out.

The immediate supervisor of the miner is the shift boss who is responsible for the quality of work, adherence to safety standards and "standard practices", day-to-day planning, and solving the production problems in two or three working places which he is legally required to visit at least daily.

At the level above that occupied by the shift boss is the mine captain (mine overseer) who is responsible for the actions of between three and five shift

bosses and whose duties are mainly related to technical mining problems and the organizing of people.

The greatest proportion of employees on a gold mine are therefore directly concerned with the basic operation of breaking and removing gold-bearing rock to the surface, or with the supervision of this process.

2.1 Basic working areas

The "stope" and the "development end" are the two basic working areas in South African gold mines and are subsequently discussed.

2.1.1 Stoping

The production of gold in South African gold mines is organized around a basic working place known as a stope. Methods of stoping are mainly dictated by factors such as the dip of the reef (angle to the horizontal), the width of the reef, the depth of the reef, and the character of the hanging (overhead rock) and the footwall (rock floor) and of the ore itself. The stope is generally rectangular in its dimensions and activities tend to be concentrated along one side, which is known as the face. The reef is stoped out along the face through a cyclic process that entails the drilling of holes, charging the holes with explosives, blasting the reef free, and the removal of the blasted rock from the new face (Mauer, 1972).

In addition to the cycle certain subsidiary activities have to be performed. These include the construction of support for the overhead rock (hanging wall) with timber or rock; conveying rock along tracks to an ore pass; sweeping fine rock from the rock underfoot (footwall); securing safe the working area;

installing pipes, tracks, ventilation columns, and maintaining these (Mauer, 1972).

The height of the stope depends on the width of the gold-bearing reef. It is generally attempted to keep this narrow as the removal of non-auriferous rock is likely to increase the cost per tons milled and reduce the recovery rate. The result is that conditions tend to be confined, dangerous and arduous. Whilst the basic operation is simple the situation is complicated by timing. Various tasks must be performed under these conditions, services must be available and maintained without losing the day's production round (Mauer, 1972).

2.1.2 Development

The second working place underground is the development end. Development is primarily concerned with blasting out rock to provide access for workers, materials and machinery and for the removal of ore. In the early stages of development of a mine the development activity tends to constitute the major proportion of activities. Rock is drilled and blasted to provide shafts, haulages, drives, crosscuts, ore passes, and large excavations such as pump chambers, stations, underground crusher stations, etc. Access is provided for electrical cables, compressed air and water, and tracks are laid for the removal of ore. As the mine becomes established, stoping tends to increase and development to decrease. The cycle is similar to that found in stoping but conditions are generally less confined (Mauer, 1972).

2.2 Hazardous mining occupations

An analysis of occupations most liable to be affected by accidents in a Free State gold mine has identified the following four most hazardous occupations in

the order of most to least hazardous: mining assistant, winch driver, drill operator and team leader. These occupations were involved in more than 60% of all mine accidents during that specific year (Loss Control Department, 1992). These occupations all function underground in the mining or development areas of a gold mine and unskilled manual labourers usually fill the posts mentioned above. White (1982) found that mining assistants were significantly more dissatisfied, more alienated, and experienced more job-related tension than team leaders.

3. STRESS FACTORS RELATED TO UNDERGROUND MINING

In this section an attempt is made to place the stressors in the South African gold mining industry within the context of the broader framework of the stresses of mining in general, and to provide some insight into the reasons why people find mining conditions stressful.

The great depths at which men are required to work is the one feature that makes the South African gold mining industry unique. The South African gold mines are the deepest mines in the world. The workings in the deepest mine in the industry descend to a depth of more than 3.6 km below the surface. There are many workers working below 3 km underground, but the majority are employed at more than 2 km below ground. The great depth at which mining is taking place is also the factor responsible for many of the physical and environmental stressors that are prevalent in underground mining. This primarily includes accidents (for example, earth-falls), lack of control, uncertainty and heat. Other secondary stressors are noise, space, light, dust and distance (White, 1982).

These stress factors are subsequently discussed.

3.1 Mine accidents

The history of the South African mining industry is marked by many well-known disasters. The following are good examples:

The Kinross mine disaster: On 16 September 1986 an underground fire killed 177 of the 2000 employees that were working underground that day (de Beer, 1988).

The St. Helena mine disaster: On 30 August 1987 an explosion occurred at a pump station at one of the St. Helena mine's shafts. This caused the cage that was passing the pump station at that time, to dislodge from its cables and fall to the bottom of the shaft. In total 63 employees were killed that day (de Beer, 1988).

The Kloof mine disaster: On 13 October 1993 earth-falls trapped 150 miners for seven days underground. Fortunately all were rescued (Volksblad, 20 October 1993).

The Vaal-Reefs mine disaster: On 10 May 1995 a locomotive went out of control. It fell on top of a cage/lift causing 105 miners falling to their death (Volksblad, 12 May 1995).

The Rovic mine disaster: On 27 November 1996 a mud rush caused the death of 20 diamond miners. The bodies of 16 of these victims could not be found (Volksblad, 1 May 1997).

The majority of mine accidents, however, are less well known due to less publicity given when only one or two employees die. Usually no publicity is given when accidents cause injuries only. The following are good examples of reports about accidents in Free State mines:

- Rocks claim 5 lives in mine (Volksblad, 13 January 1993).
- Earth-falls claim two lives in mine (Volksblad, 1 January 1994).
- Pressure burst in mine: 6 die, 5 injured (Volksblad, 4 November 1994).

- A second miner in two days has died in an earth-fall accident on the Goldfields (Volksblad, 7 December 1994).
- Two mine-workers die in rock fall (Volksblad, 17 March 1995).
- One mine-worker dead, three injured, and two missing after falls of rock (Volksblad, 16 November 1995).

Since the beginnings of the gold mine industry the continuous improvement of mine safety and prevention of accidents have been a priority. The first positive step to address the question of safety on South Africa's mines was taken in 1894 with the founding of the Rand Mutual Assurance Company to insure mining employees against accidents suffered at work. During 1913 the Prevention of Accidents Committee was formed to assist managers in their endeavours to reduce the accident rate. Two major initiatives were added to help promote safety awareness namely, a monthly safety magazine and inter-mine safety competitions which are still in practice in the industry today. In 1980, the Prevention of Accidents Committee was reorganized to improve its effectiveness and renamed the Mine Safety Division of the Chamber of Mines. However, with the increasing depth, scale and complexity of South African mines, it has become more crucial than ever that the highest safety standards and techniques are implemented (Geldenhuys, 1993).

3.1.1 Reporting of mine accidents

In the South African gold mine industry accidents are routinely reported to the Mine Safety Division. Statistics on injury and fatality rates and causal agents are regularly circulated to the members of the Chamber of Mines as part of the safety campaign (Mine Safety Division, 1996). Accidents are reported and classified in terms of the severity of resultant injuries. The following terminology is used to report these accidents:

- 1) **minor accidents** - the victim receives treatment and returns to work without losing a shift;
- 2) **disabling accidents** - the victim has lost one or more shifts as a result of the injury but the injury does not meet the criteria of a reportable accident, and
- 3) **reportable accidents** - these accidents have to be reported to the Inspector of Mines in accordance with the stipulations of the Minerals Act (Pretorius, Act 50 of 1991). According to the Regulations under sections 63 and 68 of the Minerals Act (Pretorius, Act 50 of 1991) an accident is reportable when it results in:
 - a) the death of any person; or
 - b) an injury to any person which is likely to be fatal; or
 - c) unconsciousness from heatstroke, heat exhaustion, electric shock, or the inhalation of fumes or poisonous gas or any incapacitation normally requiring treatment in a decompression chamber;
 - d) incapacitation from heatstroke, heat exhaustion, electric shock, or the inhalation of fumes or poisonous gas which will prevent the affected person from resuming his normal or similar occupation within 48 hours;
 - e) an injury, other than injuries referred to in paragraph (f), which incapacitates the injured person from performing his normal or similar occupation for a period totaling four days or more but for less than 14 days;
 - f) an injury which either incapacitates the injured person from performing his normal or similar occupation for a period totaling 14 days or more, or which causes the injured person to suffer the loss of a joint, or part of a joint or sustain a permanent disability.

In these cases the manager of the mine has to report the accident to the Principal Inspector of Mines in terms of certain prescribed regulations (Pretorius, Act 50 of 1991).

Trauma remains the single biggest cause of mortality among manual labourers in the gold mining industry. During 1992 trauma accounted for 31% of admissions to the Ernest Oppenheimer Hospital and mine accidents constituted 56% of these admissions (Goosen, 1992). The death rates and reportable injury rates for underground workers per one thousand employees in South African gold mines during 1995 were alternatively 1.5 and 21.9 and during 1996 the same rates were 1.3 and 24.5. The death rates and reportable injury rates per one thousand employees in the Free State gold mines during 1995 were alternatively 0.93 and 19.25.

The above rates only include reportable accidents and numbers of injured employees. Minor accidents and disabling accident statistics as well as the number of witnesses are excluded. The statistics increase dramatically, if for example, disabling accidents are included. For example, at least 120 cases of earth-fall accidents were reported quarterly by each of the Free State Consolidated Gold Mines in the Free State. These statistics indicate the high-risk nature of employment in the gold mines (Loss Control Department, 1992). Where a mining accident has occurred many people are involved and frequently the whole mining community is immersed in the experience (Easton, 1988).

3.1.2 Causal agents of mine accidents

Mining accidents are categorized in terms of the following causal agents:

- 1) pressure burst;
- 2) earth-fall accidents;
- 3) trucks and tramways accidents;
- 4) falling material;
- 5) explosives;
- 6) shaft accidents;

- 7) electrical/machinery;
- 8) slipping and falling; and
- 9) others (Loss Control Department, 1992; Safety and Health Division, 1996).

Earth-fall accidents were consistently the most prevalent agent over a 5-year period for all the South African gold mines. The casualty rate per one thousand employees for earth-fall accidents in the South African gold mines was 6.16 followed by the mechanical accidents rate (that is trucks and tramways accidents), which was 4.27 per thousand employees (Safety and Health Division, 1996).

3.2 Lack of control and uncertainty

Most of the hazards that exist in underground mining are due to the threat of "bumps". With the increase in mining depth, rock pressures increase linearly, and so does the probability of pressure bursts, or "bumps" (as they are known colloquially; Heunis, 1980). A disturbing feature of earth-fall accidents is that many of them are unavoidable, and nearly all of them are unpredictable. This is said to enhance their significance as stressors. Many earth-fall accidents occur in which nobody is necessarily injured (Lucas, 1969). In many of these events workers narrowly escape death. These types of incidents are known as "near misses". It is possible that the attitudes and behaviour of a miner might be permanently altered through a "narrow escape", or through serious injury, or through the death of a friend (White, 1982). Despite great advances in methods to prevent earth-fall accidents, it still remains the number one killer in South African gold mines. These occurrences will never be eliminated and the unpredictability remains (White, 1982).

According to Lucas (1969) "bumps" are the major cause of anxiety for the miner because he does not have the ability to control the threat. He says that the threat is ever-present, and is reinforced by many narrow escapes and a continuing awareness of injuries and death among colleagues. These "bumps" are capricious and uncontrollable and give no warning, the result being that each miner faces each day an uncertain, unpredictable and threatening situation (White 1982). In a clinical sample of treatment-seeking mine employees with PTSD it was found that the question "have you previously learned unexpectedly about a traumatic incident?" (American Psychiatric Association [APA], 1987; 1994) was, as in the case of Mollica, Caspi-Yavin, Bollini, Truong, Tor, and Lavelle (1992), a misnomer for this population, as most of them did (Stevens, Gagiano & Calitz., 1996).

Seligman (1975) is of the opinion that the most common result of uncontrollable stress is a "learned helplessness". He attributes it to the loss of control over reinforcements. When events are uncontrollable the outcome of one's behaviour is not contingent upon one's actions. Seligman (1975) states that this produces an emotional response known as "giving-up". Lazarus (cited in White, 1982, p.44) used the "giving-up" syndrome to explain the finding that most shipwrecked sailors die within three days, even though physiologically human beings are capable of surviving for much longer periods.

Due to the unpredictability and uncertainty created by the physical conditions, mining has a day to day quality. As a consequence miners react to their environment rather than trying to control it. This breeds a passive, fatalistic orientation towards work and life in general (Goodman, 1979). According to Lucas (1969) the miner's fatalism acts as a defence against the danger, allowing him to continue with his work unhindered, because of his belief that detection,

prediction, control, or defensive action is irrelevant because his life span is determined by other factors.

The effect of this fatalism is that miners live from day to day. There is a shortening of the time perspective, and a preoccupation with immediate gratification rather than long-term ends. This enables them to escape to some extent the many unpleasant probabilities of the future and thereby avoid high levels of anxiety (Lucas, 1969).

3.3 Heat

Heat is one of the major problems in the South African gold mines. Investigators generally agree that a comfortable working temperature is somewhere in the range of 18C to 24C (Buzzard, 1973; van der Merwe, 1977). Most of the workers in South African gold mines work in conditions in which the wet-bulb temperatures exceeds 26.7C, and wet-bulb temperatures are always a few degrees lower than dry-bulb temperatures in the same environment.

Of all the physical stressors (for example heat, cold, long hours, noise, bad lighting, inadequate nutrition) that were reviewed by Broadbent (1963), heat had the most pervasive effects. Heat has the effect of increasing the number of errors that are observed throughout the work period (not just towards the end, as is found for most other stressors, for example, noise). The effects of heat can also not be dispelled through the application of incentives, but remain just as great no matter what incentives are introduced (Broadbent, 1963).

Heatstroke and heat exhaustion are health consequences of the hot working conditions in South African gold mines. According to White (1982), heat stress is more problematic on the South African gold mines than it is in any other mining

undertaking in the world, and this is the only mining field where heatstroke has been identified as a potentially serious problem.

Results of various studies reviewed by White (1982) on the effects of heat show that it is energy sapping, that it has adverse effects on health and on physiological functioning, that it increases the probability of accidents and that it interferes with performance.

3.4 Noise

Broadbent (1963) reported that noise above the levels at which conversation is possible increases the probability of errors, and has an adverse effect on alertness and vigilance. Normal conversation is impossible whilst the rockdrills are operating. The supervisor frequently has to stop the drillers from working while he relays instructions to his crew (White, 1982). It may thus be assumed that increased fatigue may be particularly experienced by machine operators responsible for drilling holes for explosives.

3.5 Space

Confined working space is another factor associated with gold mining. The gold is usually found in veins of less than 0.3 m wide. The aim is to remove as little of the rock surrounding the gold-bearing reef (known as the "waste") as possible. It is therefore not uncommon to find stopes with a working height of 1 m or less. It is also relatively unusual to find stopes with a working height greater than 1.5 m. A normal upright stance is therefore impossible in these conditions. The mineworker is thus forced to perform his work in very cramped positions, which adds to the physical stress involved. For the most part the mineworker is forced to crawl on all fours in stopes. On occasion he must slide on his stomach to get

past places where the hanging is unusually low or to get over big rocks that have not yet been removed from the floor (which is known as the "footwall"). The footwall and hanging are extremely rough (and jagged in places), as are the sidewalls and the stope face which is being mined. Under these circumstances minor injuries such as cuts, bruises and abrasions are extremely common. Furthermore, the footwall is always damp because of the water used to settle the dust. Under these conditions miners are usually wet and filthy. White (1982) states that these circumstances need to be experienced to be truly believed.

3.6 Light

Darkness is an additional stress factor faced by underground mineworkers. The only source of illumination in the stopes and in most of the access ways is the miners' cap-lamps. Unfortunately these lamps only provide a very direct and weak source of light. The process of monitoring the underground environment for dangerous working conditions such as loose pieces of rock in the roof (also known in mining as the "hanging") and obstacles in the way (for example, tools and equipment left lying around carelessly), are therefore extremely difficult (White, 1982).

3.7 Dust

Another problem associated with underground work is the high dust levels that constitute a serious health hazard to mineworkers. Chest X-rays are taken of workers annually to screen them for pneumoconiosis and other respiratory diseases in order to ensure early diagnosis. The main causes of the dust particles are the blasting and drilling operations (White, 1982).

3.8 Distance

A mineworker's relief can only be imagined when he is finally transported to the surface after a hard shift and steps once more into the sunlight and fresh air. However, before this can happen the worker often has to travel for more than an hour through the underground workings in order to reach the shaft. And then he often has a long wait underground for a lift/ elevator (a "cage" in mining terms) to take him to surface. Furthermore, as the more accessible gold bearing reef gets mined out, a worker has to travel further and further distances underground in order to get to his workplace. It is thus not unusual to find men traveling for more than an hour each way to reach their stopes. This does not include whatever time is required on the surface to get home from work and vice versa. These long underground travelling times increase the length of the working day considerably (often by more than 25%), thereby adding to the stresses of the job (White, 1982).

4. SUMMARY

The majority of mineworkers work in the so-called developing and stoping areas. They are mostly mining assistants, machine operators, winch drivers and team leaders. This environment appears to be highly stressful and seems to warrant being labelled as a high-risk environment for PTSD.

The mentioned physical and environmental stressors are an integral part of mining and cannot be eliminated. The underground work on the gold mines in South Africa is performed in environmental conditions that are among the most severe working conditions that exist anywhere in the world (White, 1982). Not only is the mineworker continually faced with danger, heat, dust, noise, darkness,

confined spaces, rough surfaces, dampness, filth and dirt, he is also required to work long hours in these conditions and to perform arduous and strenuous tasks. Pressure for production, close supervision and difficult decisions (arising partly from uncertainty and lack of control) are ever-present (White, 1982).

Mine accidents are categorized according to various causal agents of which earth-falls are the most prevalent. This therefore indicates the importance of studying the nature of these occurrences in more detail (for example, to be trapped, to be injured, to be pinned down by the rocks, to assist in rescue) in terms of the psychological effects they have on the victims.

This overview of circumstances affecting employees on gold mines leads to a discussion of literature relevant to PTSD.

CHAPTER 3: THE HISTORICAL EVOLUTION OF THE PTSD DIAGNOSTIC CRITERIA

1. INTRODUCTION

Viewed from a historical perspective, the emergence of a widespread interest in PTSD by the medical and behavioural sciences as well as its prominence in litigation is understandable, perhaps to be expected when examined retrospectively against some major events of the 20th century. These events include for example, the two world wars, the atomic bombing of Hiroshima, widespread civil violence, catastrophic disasters of human and natural origin, the growing awareness of domestic violence and childhood sexual abuse, and many other forms of catastrophic stress (Wilson 1995). The aim of this chapter is to review the historical development of the PTSD diagnosis and to present the latest diagnostic criteria of PTSD according to the Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the Tenth Revision of the International Classification of Diseases (ICD-10).

2. DIAGNOSTIC TERMINOLOGY

The influence of exceptional stress on human behaviour has long since been acknowledged under different names. One of the oldest formulations pertains to Nostalgia - a psychological disorder - that consists of a decline in mental and physical health in homesick soldiers (Hoffer, 1678; cited in Rosen, 1975). Nostalgia was diagnosed during the American Civil War (1861-1865) for soldiers lacking sufficient character to adjust to the requirements of wartime. It is during this period that DaCosta (1871) erroneously attributed it to an "irritable heart" a syndrome among soldiers characterized by palpitations, chest pain or

heaviness, tachycardia, shortness of breath, headache, sweating and gastro intestinal disturbances and it became known as DaCosta's Syndrome (Wooley, 1982).

During the Russo-Japanese War (1904-1905) the Russians used the diagnostic terms "hysteria" and "neurasthenia" to identify those reactions to battle that were characterized by confusional states and hysterical excitement of short duration, succeeded by marked irritability, fearfulness and emotional instability lasting for some weeks (Baker, 1980).

During World War I (1914-1918) the terms "Soldiers' Heart" and "Irritable heart" were intensively researched by cardiologists (Meakins and Wilson, 1918). The official British label for field medical cards during this time period was "N.Y.D.N."-"Not Yet Diagnosed, ? Nervous". The common appellation, however, was "shellshock" (Armfield, 1994; Baker, 1980). It was derived from the fact that it was a static war that was mostly fought in trenches and soldiers were therefore frequently exposed to heavy shelling.

In the early phases of World War II (1938-1945) traumatic war disorders were considered as functional in origin and were designated as "psychoneurosis, anxiety state", "anxiety reaction", "psychoneurosis mixed" and "conversion hysteria" (Armfield, 1994; Baker, 1980). This implied prolonged psychoanalysis, a practice which brought on a virtual epidemic, with a discharge rate for neuropsychiatric disorders in 1943 of 35.6 enlisted men per 1,000 mean strength per year (Armfield, 1994). The floodgates had to be closed and in 1943 the term "Combat exhaustion or Battle Fatigue" was coined by a team of American Psychiatrists in a successful effort to address the high levels of psychiatric repatriation and poor treatment outcome of the previous diagnosis. This term was

deliberately chosen to remove any mental health connotation. This diagnosis enabled mental health workers to allow victims to rest and receive brief treatment behind the battle zones before being sent back to their units (Armfield, 1994; Jones, 1987).

"Combat exhaustion" was defined as a picture of psychological disorganization that does not correspond either in its moderate or extreme form to any recognized or established psychiatric condition (Baker, 1980). Since it was no longer a psychiatric condition, "fatigued" soldiers were not removed from combat (Armfield, 1994). It was a popular term in the military services and was a standard diagnosis during the Korean War (1950-1953; Baker, 1980). This policy was institutionalized with the requirement of one-month duration of symptoms for a PTSD diagnosis of the Third Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III; Armfield, 1994). During the Vietnam War this diagnosis was seldom made which was thought to be due to the intermittent nature of combat incidents. In the early 1970's however, the diagnostic term "post Vietnam syndrome" began to be applied to Vietnam veterans who showed social maladjustment and psychopathology after returning to civilian life.

The terms "prisoner of war syndrome" and "concentration camp or K-Z Syndrome" were retrospectively arrived at on the basis of unique features which could be linked to a specific stressor (Baker, 1980). Concentration camp syndrome was also known as "repatriation neurosis" with the most frequent symptoms being restlessness, excessive fatigue, increased smoking, irritability, complaints of defective memory, and vegetative nervous symptoms, notably diarrhoea without any demonstrable cause (Eitinger, 1961). The "concentration camp syndrome" occurred so regularly without any evidence of predisposition among such a high proportion

of survivors that it became clear that the symptoms were almost entirely the result of psychological trauma itself. The existential factors involved in surviving the concentration camp were vividly described by Victor Frankl in his book "From Death Camp to Survival" (Andreassen, 1980; Davidson, 1995; Kinzie, 1989).

The term "Bossies" was a lay term used for veterans of the South African Defence Force suffering from a similar "combat exhaustion" clinical picture. Directly translated the term means "bushes" and was used for veterans who seemed insane, to indicate that they had been in the bush too long (Kleu, 1979). The Israeli Defence Force use the term "combat stress reaction" for the same clinical picture (Solomon, 1993). The above-mentioned concepts appear to be synonyms for what is currently known as Acute Stress Disorder and PTSD as is described in the DSM-IV (APA; 1994).

During the 1940's and 1950's clinicians studied posttraumatic syndromes that occurred as a consequence of stressors other than military combat. Alexandra Adler conducted the first extensive description of the posttraumatic effects of a civilian catastrophe. She examined the disastrous effects of the Coconut Grove Fire in 1941 (Andreassen, 1980; Davidson, 1995; Kinzie, 1989). The importance of anxiety and depression symptoms which could persist for at least one year after the traumatic incidence was highlighted (Andreassen, 1980).

Theories of the syndrome's psychological etiology began to compete with physical causation theories in the early 1900s. Oppenheim, who believed that this syndrome had an organic structural origin, first used the term "traumatic neurosis" in the late 19th century. He recognized four separate syndromes

occurring in patients who had suffered injury: traumatic neurosis, organic syndromes, hysteria and neurasthenia (Andreassen, 1980; Davidson, 1995; Kinzie, 1989). This biological point was countered by Charcot, who believed that traumatic neuroses were psychogenic in their origins and he pointed to the effectiveness of hypnosis in inducing similar symptoms as evidence for his position (Andreassen, 1980; Davidson, 1995; Kinzie, 1989).

Stimulated by Charcot's teachings at the end of the nineteenth century psychiatrists attempted to define how psychological trauma effects the psyche. For both Pierre Janet and Freud this formed the basis of their early theories about the nature and treatment of psychopathology (van der Kolk & van der Hart, 1989; van der Hart & Horst, 1989). Janet was the first to systematically study dissociation as the crucial psychological process with which organisms react to overwhelming experiences and to show that traumatic memories may be expressed as sensory perceptions, affect states, and behavioural re-enactments. Amnesia, reduced interest and involvement, constricted affect and loss of will to act effectively represent ways of avoiding having to deal with traumatic memories (van der Kolk & van der Hart, 1989). Since Janet, this alternation between intrusive and avoidant symptoms has been noted by Freud and many others (Horowitz, 1986; Kardiner, 1941; Krystal, 1969; Lindemann, 1944; van der Kolk & van der Hart, 1989).

Following a sojourn in Charcot's clinic, where he became familiar with Janet's early work, Freud viewed "traumatic neurosis" as the result of the reactivation of an unresolved conflict in a predisposed person. Childhood traumas or conflicts that may lie dormant outside of the individual's consciousness were emphasized (Davidson, 1995; Kinzie, 1989; van der Kolk & van der Hart, 1989). The stressor

was considered to be not of primary importance but, rather, an event that brought to awareness as trauma the previously unresolved conflicts. This was consistent with the view that objective trauma itself could not cause a neurosis without significant childhood predisposition (Davidson, 1995; Kinzie, 1989). Freud's conceptualization of traumatic neurosis dominated thinking in the medical-psychiatric profession from about 1895 to the end of the Vietnam War era (1962-1975) in the United States (Wilson, 1995).

As society grew more litigious and orientated toward receiving compensation for injuries, investigators also began to study compensation neurosis and attempted to develop ways of distinguishing it from true traumatic neurosis (Andreassen, 1980). Psychophysiological studies were performed during World War I, mainly by cardiologists (Shalev & Rogel-Fuchs, in press). Kardiner (1941) conceptualized posttraumatic syndromes as variants on a theme of "physioneurosis". This term is a reflection of the notion that posttraumatic syndromes reflect an inextricable combination of biological and psychological trauma. As early as 1941 Kardiner empirically defined the syndrome, that would later come to be called PTSD and with minor changes be integrated into the third DSM (DSM-III), as possessing five key clinical features: 1) constriction of personality functioning, 2) exaggerated startle reflex, 3) psychic fixation upon a traumatic event, 4) atypical dream experiences, and 5) a tendency for explosive and/or aggressive reactions (American Psychiatric Association [APA], 1980; Blanchard, Kolb, Pallmeyer & Gerardi, 1982; Davidson, 1995; Everly, 1993; Everly, 1995a; Shalev & Rogel-Fuchs, 1993).

Partly because of the effects of World War II and the Coconut Grove fire, psychological trauma was recognized as an important and legitimate mental

disorder when included in the First Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-I; Davidson, 1995). Recognition of the neurosis of World War II veterans led to the category of "gross stress reaction" in the DSM-I in 1952. It also appeared in the International Classification of Diseases (ICD). Despite the Syndrome's being well described in multiple settings, the category was not included in the second edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-II) in 1968 (Davidson, 1995; Kinzie, 1989; Scrignar, 1988; Wilson, 1995).

An influential report on the phasic reaction of intrusive responses alternating with avoidance behaviour and denial (Horowitz, 1974), the increasing problems of Vietnam veterans plus clinical work with victims of multiple disasters made clear a need for a posttraumatic stress category on the DSM-III (Davidson, 1995; Kinzie, 1989; Scrignar, 1988; Wilson, 1995). The syndrome was then placed with the anxiety disorders, but unlike most other disorders in the DSM-III, PTSD did not undergo prior extensive field or interrater reliability studies, resulting in some controversy over its validity (Kinzie 1989; Wolfe & Keane, 1990). Studies done after the appearance of the DSM-III generally confirmed the disorder's validity. As clinical research and experience mounted it gave rise to modification of the criteria in both the revised edition of the third Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; APA, 1987) in 1987 and the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; APA, 1994) in 1994.

3. PTSD DIAGNOSTIC CRITERIA

This research project based the diagnosis of PTSD on the diagnostic criteria of the most recent edition of the APA (1994), the DSM-IV. The DSM-IV PTSD diagnostic criteria are subsequently reviewed in comparison with the Tenth Revision of the International Classification of Diseases (World Health Organization [WHO], 1992a).

3.1 DSM-IV: Posttraumatic Stress Disorder

The Gross Stress Reaction (GSR) of the DSM-I (APA, 1952) was the first formal recognition that in "conditions of unusual stress" a normal person may manifest stress related behaviours in response to "intolerable stress" (APA, 1952; Wilson, 1995). The traumatic stress responses were however relegated in importance and the category of GSR was inexplicably dropped completely from the DSM-II. Traumatic stress responses were subsumed under the rubric of "adjustment disorder of adult life" (APA, 1968; Andreassen, 1980; Davidson, 1995; Wilson, 1995; Wolf & Keane, 1990). This labelling appeared to reflect some basic unawareness of the disorder's debilitating symptom features and its frequently treatment-resistant course.

Twelve years after the DSM-II, DSM-III (APA, 1980) endorsed the existence of a definite posttraumatic stress disorder (PTSD) as a major diagnostic entity within the anxiety disorders. The prime criterion was the "existence of a recognizable stressor that would evoke significant symptoms of distress in almost everyone". Three clusters of symptoms were identified, which include re-experiencing the trauma, numbing and detachment responses, and changes in personality that were

not present before the trauma. Finally, this interest in PTSD generated studies in disaster, trauma and victimization and has brought forth new revisions in the criteria that are evident in the DSM-III-R and the DSM-IV (Wilson, 1995). The DSM-III-R offered new information about the primary and secondary symptomatology of the disorders as they were found in wider range populations, including, for the first time, traumatized children as well as adults (Wolfe & Keane, 1990).

The diagnostic criteria of the DSM-IV reflect minor changes from the DSM-III-R. The DSM-IV PTSD criteria are presented in table 1.

Table 1 DSM-IV Diagnostic Criteria for 309.81 Posttraumatic Stress Disorder.

-
- A. A person has been exposed to a traumatic event in which both of the following were present:
- (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others
 - (2) the person's response involved intense fear, helplessness or horror.
Note: In children, this may be expressed instead by disorganized or agitated behaviour
- B. The traumatic event is persistently re-experienced in one (or more) of the following ways:
- (1) recurrent and intrusive distressing recollections of the event, including images, thoughts or perceptions. **Note:** In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.
 - (2) recurrent distressing dreams of the event. **Note:** In children, there may be frightening dreams without recognizable content.
 - (3) acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). **Note:** In young children, trauma-specific reenactment may occur.
 - (4) intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event
 - (5) physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event
- C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:
- (1) efforts to avoid thoughts, feelings, or conversations associated with the trauma
 - (2) efforts to avoid activities, places, or people that arouse recollections of the trauma

- (3) inability to recall an important aspect of the trauma
- (4) markedly diminished interest or participation in significant activities
- (5) feeling of detachment or estrangement from others
- (6) restricted range of affect (e.g., unable to have loving feelings)
- (7) sense of foreshortened future (e.g. does not expect to have a career, marriage, children or normal life span)

- D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:
- (1) difficulty falling or staying asleep
 - (2) irritability or outbursts of anger
 - (3) difficulty concentrating
 - (4) hypervigilance
 - (5) exaggerated startle response
- E. Duration of the disturbance (symptoms in criteria B, C, and D) is more than 1 month.
- F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Specify if:

- Acute:** if duration of symptoms is less than 3 months
- Chronic:** if duration of symptoms is 3 months or more

Specify if:

- With Delayed Onset:** if onset of symptoms is at least 6 months after the stressor

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The definition of the traumatic stressor has been altered, compared to the previous DSM editions, basing the new criteria on the event itself and the emotional response it induced in the person i.e., the person responded to the stressor with fear, horror or helplessness. Some other stressors which were previously disqualified have been added, for example, life-threatening illness (APA, 1987; APA, 1994; Davidson, 1995; Wilson, 1995).

The DSM-IV PTSD diagnosis includes three clusters of symptoms. First, a person with PTSD must re-experience ("B" criteria) the traumatic event in at least one out of five possible ways. The second cluster ("C" criteria) combined avoidance behaviour with numbing of general responsiveness that occurs as a result of the

traumatic event. A victim of trauma must experience at least three of the seven symptoms of the "C" criteria to receive a PTSD diagnosis. Persistent symptoms of increased arousal reflects the third cluster ("D" criteria) of the PTSD symptomatology. At least two of the five "D" criteria have to be experienced in addition to the above-mentioned symptoms to receive a PTSD diagnosis (table 2.1). The "D" criteria directly concern states of increased physiological arousal underscoring recent advances in the psychobiology.

An additional criterion ("F" criterion) was included in the DSM-IV. This criterion requires the victim to experience clinically significant distress or impairment in functioning before the PTSD diagnosis can be made (APA, 1994).

The subtypes, acute and chronic PTSD as they were in the DSM-III, have been reintroduced in the DSM-IV PTSD criteria. Otherwise, the duration of the syndrome, as well as the Delayed Onset PTSD subtype remained similar to the DSM-III-R criteria (APA, 1980; APA, 1987; APA, 1994).

The DSM-IV emphasizes several associated symptoms not included in the PTSD-criteria, for example, guilt feelings, phobic reactions, dissociative symptoms, somatic complaints, shame, impulsive behaviour and personality changes. Culture and age-related symptoms have been elaborated on in the DSM-IV (APA, 1994).

According to Wilson (1995) the re-shuffling of symptoms from the DSM-III-R to the DSM-IV does emphasize problems with the boundaries and identity of PTSD and it is quite possible that changes could still be expected in the new DSM editions.

3.2 Tenth Revision of the International Classification of Diseases (ICD-10): Posttraumatic Stress Disorder

The International Classification of Diseases (ICD) is revised regularly, at approximately ten-year intervals. The sixth revision of the ICD contained the first separate section on mental disorders with minor changes in the seventh revision of the ICD. Considerable dissatisfaction existed with these classifications. The eighth revision of the ICD (ICD-8) included the category of Transient Situational disturbances. Emphasis was placed on the transient nature of the disorder and, like PTSD it recognized the causative role of the stressor in symptom development. The ninth revision of the International Classification of Diseases (ICD-9) further specified the causative role of the stressor in the characteristic course of stress response syndromes by defining the categories "Acute reaction to stress" and "Adjustment reaction". However, no category within the ICD-9 is precisely equivalent to PTSD. The closest equivalent is acute reaction to stress which is nearly identical to gross stress reaction in DSM-I and, therefore, conceptually quite different from PTSD (Andreassen, 1980; APA, 1987; de Girolamo, 1992; Kinzie, 1989; World Health Organization, 1977).

The high degree of incompatibility between the DSM and ICD hampered research, especially since PTSD was not included in the ICD. A group of American mental health scientists convened to modify the ICD-9 to satisfy certain unfulfilled needs. Experiences derived from the use of this Clinical Modified ICD-9 (ICD-9-CM), the ICD-9, the DSM-III and the DSM-III-R have been invaluable in the development of the Tenth Revision of the International Classification of Diseases with the aim that the ICD and the DSM be as compatible as possible (APA, 1987; Davidson, 1989).

In an attempt to be as compatible as possible, the ICD-10 included PTSD whilst the DSM-IV included the Acute Stress disorder (World Health Organization [WHO], 1992; APA, 1994). ICD-10 (WHO, 1992a) brought together "Acute Reaction to Stress" and "Adjustment Reaction" of the ICD-9 in the overall category of Reaction to severe stress, and adjustment disorders (F43). This category includes acute stress reactions (F43.0), posttraumatic stress disorders (F43.1), and adjustment disorders (F43.2; WHO, 1992a).

The ICD-10 includes the three main criteria (re-experiencing, avoidance and numbing, and increased arousal symptoms) for the PTSD diagnosis. In both the ICD-10 and the DSM-IV the exposure to an "exceptionally traumatic" event has been considered a necessary condition for the occurrence of PTSD. The stressor criterion of the ICD-10 however, is more a reflection of the DSM-III-R's stressor criterion than that of the DSM-IV. Whilst PTSD of the DSM-IV have been included with the Anxiety disorders, the ICD-10 has developed a new category of stress disorders which includes PTSD. This reflects the current unresolved debate with regard to the phenomenology of PTSD on the one hand, but also an agreement that at last exists with regard to the chronic psychological effects of severe stressful events (APA, 1987; APA, 1994; de Girolamo, 1992; WHO, 1992a).

The inclusion of the clearly defined category of PTSD in the ICD-10 may be of special importance for epidemiological and clinical research in which the lack of diagnostic standardization and of operational criteria for PTSD have hampered the progress of our knowledge. The capacity of health services to provide care and to evaluate the effects of their interventions is also likely to improve (de Girolamo, 1992).

4. SUMMARY

This review of the historical development of PTSD as a diagnostic syndrome, reveals three main orientations in the perception of PTSD, namely, the psychological reaction to trauma as a neurosis (Freud), the dissociation orientation (Janet), and finally the psychological reaction to trauma as a stress disorder (Kardiner).

The influence of Freud and the role of predisposition is seen in the diagnostic criteria of gross stress reaction of the DSM-I (APA, 1952) and the absence of traumatic stress syndrome in the DSM-II (APA, 1968). On the other hand, the influence of Kardiner, who considered the magnitude of a stressor enough to bring about psychological as well as physiological change is seen in the DSM-III, DSM-III-R and DSM-IV PTSD criteria (APA, 1980; APA, 1987; APA, 1994). Janet's influence is seen in the emphasis of dissociative symptoms in the Reaction to Severe Stress diagnosis of the Ninth and Tenth Revisions of the International Classification of Diseases and the inclusion of Acute Stress Disorder in the DSM-IV, which also emphasizes dissociative symptoms (APA, 1987; APA, 1994; World Health Organization [WHO], 1992).

The scientific acknowledgement of the effects that severe stressors have on the health of victims - starting with Dacosta in the 1870's - reached a significant milestone in the 1990's when the ICD and the DSM both accepted PTSD as well as Acute Reaction to Stress in their new editions. Reactions to severe stress are now being understood and accepted as a process which could have immediate, acute as well as chronic pathological implications. All the gaps in possible reactions

at any time after a severe stressful event have now been accounted for. The foundation has been laid for challenges such as assessing PTSD in different cultures and circumstances, determining one-mindedness also in terms of the disorder as an anxiety, stress, or dissociative syndrome and developing insight into the pathogenesis of the disorder.

The next chapter reviews scientific reports on the nature of PTSD. These findings are discussed, with reference to the South African gold mining population and the bearing they may have on this group of people.

CHAPTER 4: THE NATURE OF POSTTRAUMATIC STRESS DISORDER

1. INTRODUCTION

In this chapter literature on the epidemiology, the symptoms and signs, the course and the differential diagnosis of posttraumatic stress disorder are reviewed and discussed.

2. EPIDEMIOLOGY

Efforts have been made throughout history to quantify the prevalence of posttraumatic stress reactions. Difficulties existed as a result of varying diagnostic labels that were applied prior to the advent of the PTSD classification (de Girolamo, 1992; Everly, 1995a). Furthermore, the prevalence of psychiatric morbidity varies with variations in a disaster's overall impact on the community, the type of disaster events and severity of exposure, the percentage of the population affected, the differences in the involved population, and varying methodology (Pynoos & Nader, 1989; WHO, 1992b).

Very little is known about the psychiatric epidemiology of disasters in developing countries (de Girolamo, 1992; WHO, 1992b). Because of the often devastating physical impact which natural disasters have on populations living in developing countries and because of the scarcity of resources there, interventions have generally been confined to rescue and to the provision of basic medical care, with a corresponding neglect of psychological needs and related epidemiological research and intervention. It is furthermore difficult to apply findings from research carried out among populations which are only infrequently affected by disasters on populations with extended experience in coping with natural disasters, especially in developing countries. The different

culture patterns, social structures and coping behaviours may reasonably modify the incidence, the severity and the psychosocial outcome, pointing to a need for specific research on these populations (WHO, 1992b).

Studies on the prevalence of PTSD can be grouped into studies of community populations and studies of high-risk groups exposed to trauma (Davidson, 1995) which are subsequently discussed.

2.1 Community studies

In a major "Epidemiological Catchment Area Program" survey, Helzer, Robins and McEvoy (1987) found the lifetime prevalence of PTSD in one area of the general population (St. Louis) to be 0.5% among men and 1.3% among women. In the general population of the United States the figure was about 1%. Davidson, Hughes, Blazer and George (1991) found the six-month and lifetime prevalence rates for PTSD in another area (North Carolina) to be 0.44% and 1.3% respectively. Furthermore, PTSD became chronic in 46% of all persons who developed the disorder. A study by Shore, Tatum and Vollmer (1986) showed a prevalence rate for PTSD of 2.6% in an American community, unselected according to risk. According to the DSM-IV (APA, 1994) the lifetime prevalence rate for PTSD ranges from 1% to 14%.

According to Everly (1995a) PTSD is probably underreported and under diagnosed and the prevalence of PTSD among the general population is most likely underestimated given the events that are usually associated with posttraumatic stress.

2.2 High-risk groups

Some studies have defined "high exposure" as personal involvement including both physical injury and perceived threat to life (Foy, 1992). PTSD rates in clinical populations with high exposure have been found to be consistently associated with more than twice the risk found for low exposure in combat victims and sexual assault survivors (Foy, 1992). Psychological morbidity tends to affect some 30% to 40% of a disaster population within the first year following it. At two years the levels are generally less but with a persistent level of morbidity that seems to become chronic for some individuals and some disasters (Baum, 1987; WHO, 1992b). Raphael (1986) states that persisting levels of over 30% severe impairment can be expected in man-made disasters. According to the DSM-IV (APA, 1994) the prevalence rates yielded by studies of at-risk individuals range from 3% to 58%. Since mine accidents are usually categorized as industrial, accidental or natural trauma, literature on the prevalence in these kinds of trauma is reviewed.

In a high-risk group of 50 fire-fighters it was found that a total of 32% of the subjects developed PTSD or "borderline" PTSD. From this group 18% suffered from chronic PTSD. A 42 month follow-up showed 24% still suffering from chronic PTSD (McFarlane, 1988c). In another study of 315 fire-fighters McFarlane (1988b) found acute PTSD in only 9% of the sample, whereas 21% went on to develop chronic PTSD and 20% to develop delayed onset PTSD. However, only 10% however, had persistent chronic PTSD and 3% persistent delayed onset PTSD. Breslau, Davis, Andreski and Peterson (1991) found that the prevalence rate of a cohort of young adults exposed to traumatic events was 23.6%. In another study Ursano, Fullerton, Kao and Bhartiya (1995) found a PTSD prevalence rate of 11% at one month in young adult male disaster workers who were exposed to traumatic death. The symptoms

decreased over time and only 2% were still symptomatic after 13 months (Ursano et al., 1995).

A review of literature on adult burn patients indicated that the prevalence of PTSD varied from 7% to 45% depending on the timing of the assessment (Tarrier, 1995). In a study of motor vehicle accident victims with injuries of sufficient severity to warrant hospitalization, Green, McFarlane, Hunter and Griggs (1993) found that at least 33% developed PTSD.

The prevalence of posttraumatic stress reactions after an industrial disaster was measured - in one group of survivors that experienced, another group that witnessed and a third group that were less involved than the previous two - 1 week, 7 months and 4 years after the incident. A total of 246 subjects participated in the study. Moderate to severe reactions were found 1 week after the explosion in 43% in group A, 22% in group B, and 10% in group C. After 7 months there was a decline in the point of prevalence of PTSD to 36%, 17%, and 4%, respectively, in the 3 groups. After 4 years the percentages were 19, 1.8, and 2.6, respectively (Weisaeth & Eitinger, 1993).

Parker (1977) has shown that 58% of people evacuated after a cyclone in Darwin, Australia, could be classified as psychiatric cases one week after the evacuation. Twelve weeks later the proportion dropped to 46% and a little more than a year later it dropped to 22%. In another cyclone study in Sri Lanka Patrick and Patrick (1981) found that 70% of the disaster population were psychologically disturbed. Four weeks later only 46% remained disturbed. Madakasira and O'Brien (1987) found that 59% of tornado victims met the criteria of acute PTSD 5 months after the tornado.

Actual numbers killed in disasters are estimated to be some 3 or 4 times higher in developing countries than in developed countries and the numbers of affected survivors is estimated to be some 40 times higher in developing countries. The extent of risk, especially in developing countries, has increased over the last few decades due to increasing population size, greater population density in vulnerable areas and the strong tendency of large populations towards urbanization. It must be assumed that this indicates a massive psychosocial as well as physical need for this latter group (WHO, 1992b).

The South African gold mining environment has previously (see Chapter 1) been defined as a high-risk environment for trauma. The above-mentioned statistics on prevalence rates in high-risk environments are thus very alarming if they are generalized to the underground mining population. It would therefore be valuable if statistics on prevalence rates of PTSD in gold mines could be determined.

3. THE SYMPTOMS AND SIGNS OF PTSD

PTSD is a complex syndrome with a great diversity of symptoms, manifestations, and prognoses (Kinzie & Leung, 1989; Solomon, 1993). Although the core of PTSD symptoms is similar in casualties of a large range of catastrophic events (Horowitz & Kaltreider, 1995), clinical studies show both variations within the posttraumatic syndrome and a large variety of symptoms above and beyond those included in classic PTSD (Solomon, 1993). Horowitz (1993) emphasized that clinicians should have a good knowledge of the signs and symptoms of PTSD and that they should ask after them, as most patients do not have adequate descriptive language for mental experiences to report them spontaneously.

The PTSD symptom clusters - intrusive and re-experiencing memories, avoidance and numbing reactions, and symptoms of increased arousal - are subsequently

discussed. Thereafter associated PTSD symptoms and literature on the longitudinal course of PTSD are reviewed.

3.1 Re-experiencing symptomatology

The various ways of re-experiencing a traumatic incident demand an ability to recall. Symptoms such as intrusive ideation, repetitive memories associated with the trauma, intrusive dreams, flashbacks and illusions, serve as an indication of the re-collective processes (Everly, 1993; Scrignar, 1988). Everly (1993) speculates that an enhanced memory of the traumatic event and conditions associated with the event may serve some self-preservation function. An enhanced memory of life-threatening experiences serves to increase the likelihood that one would avoid situations in any way related to those that might engender a threat to one's life or well being. Avoidance would be aided by some greater hypervigilance function to any situation resembling the traumatic incident (Scott & Stradling, 1992; Everly, 1993). According to Everly (1993) these recollective processes should be viewed as one-half of the "core" phenomenological constituency of PTSD with arousal as the second of the "core" constituents.

According to Pitman, van der Kolk, Orr and Greenberg (1990) the B criteria of PTSD (intrusion) are phasic, in other words they are manifested only from time to time, especially when they are evoked by some salient environmental event. They constitute the cognitive functions of the syndrome and are the sine qua non for PTSD and distinguish it from other anxiety disorders.

Re-experiencing phenomena were found to have the lowest specificity of all the PTSD phenomena (McFarlane, 1986). According to McFarlane (1993) these phenomena are as much a marker of the fact that an individual has had an extremely traumatic experience as they are of psychopathology. In an outpatient setting,

however, such re-experiencing memories would be a highly specific marker of PTSD because very few patients would have been exposed to extremely stressful life events (McFarlane, 1993). The DSM-IV PTSD re-experiencing symptoms are subsequently discussed.

3.1.1 Recurrent and intrusive distressing recollections of the event

Distressing recollections are among the cardinal features of PTSD (Scott & Stradling, 1992; Shalev & Rogel-Fuchs, 1993). The recurrent and intrusive distressing recollections of the event include images, thoughts and perceptions (APA, 1994). Intrusive images are unbidden sensations in any modality. The emphasis here is on sensory quality (for example, visual, odour, olfactory, auditory and sensational memories), which, however similar to that of ordinary thought images, may be more intense and occur as a sudden unwanted non volitional entry into awareness. Visual images are believed to be the most common. Victims may be preoccupied and ruminate about the traumatic event. This involves continuous awareness about the event and associations with the event beyond those involved in ordinary thinking through a problem or situation to a point of decision or completion. It has a sense of controlled repetition to it. It involves thoughts that pop into the mind suddenly and unbidden with the victim having difficulty in dispelling the ideas. Once the idea has come to mind, even if thinking about it were deliberate, the person cannot stop awareness of the idea or topic. Emotions and moods that cannot be stopped are included (Brett & Ostroff, 1985; Fullerton, McCarroll, Ursano, & Wright, 1992; Horowitz, 1979; Miller, 1994; Scott & Stradling, 1992; Solomon, 1993; Weiss, 1993). They may keep the victim from falling asleep (Scott & Stradling, 1992; Solomon, 1993).

Intrusive recollections were found to be highly predictive of long-term psychopathology in subjects exposed to disaster (Baum, 1990). The experience of

intrusive recollections in close temporal proximity to the disaster, was found to be a much better predictor of who was at risk of developing a psychiatric disorder than the extent of the losses sustained or the intensity of the individual's confrontation with death or injury (McFarlane, 1993). Shalev (1992) on the other hand, found that early symptoms of intrusion, as recorded during admission after the trauma, failed to predict PTSD.

Intrusive thoughts were found to be the most frequently reported symptom in victims of a tornado (Madakasira & O'Brien, 1987). McFarlane (1988c) found intrusive thoughts to be less specific (65%) and more sensitive (89%) in a recently (8 months) traumatized group and he concluded that intrusive thoughts and feelings might not be specific enough as a diagnostic criterium for PTSD.

According to Janoff-Bulman (1995), information from and reactions to traumatic events are stored in active memory and account for the intrusive thoughts experienced by victims. These intrusions cease when the information has been integrated and thereby is no longer stored in active memory. In other words, the traumatic event must be assimilated into the victim's assumptive world.

These findings therefore suggest that intrusive recollections could also be expected in most of the victims of mine accidents. In fact, intrusive symptoms were also one of the most frequently experienced symptoms in a group of treatment-seeking mine employees with PTSD (Stevens, Calitz & Gagiano, 1996).

3.1.2 Recurrent and distressing dreams of the event

Most authors report disturbed dreaming and nightmares to be a result of exposure to trauma (Fullerton et al., 1992; Weisaeth & Eitinger, 1993). Disturbed dreaming has been said to be a prominent abnormality in chronic PTSD and it

should be recurrent and distressing to be marked as present (Friedman, 1988, Solomon, 1993; Weiss, 1993).

Friedman (1981) stated that traumatic nightmares associated with PTSD do not meet criteria for REM-related dream anxiety attacks nor are they typical of a stage 4 night terror/nightmare syndrome. In fact, Ross, Ball, Sullivan and Caroff (1989) said that dream disturbance associated with PTSD may be relatively specific for this disorder, and dysfunctional REM sleep mechanisms may be involved in the pathogenesis of the posttraumatic anxiety dream. They felt that PTSD nightmares might actually be a newly identified phenomenon called REM sleep without atonia.

Traumatic nightmares have been found to occur mostly between 2 and 3 A.M. during stage II or stage III sleep, and are thus not confined to REM sleep alone (van der Kolk and Saporta, 1993; Shlosberg and Benjamin; 1979). The PTSD nightmare is reported to be an exact replay and re-experience of the traumatic event (Friedman, 1995; Ross et al., 1989), whereas during REM they are more typically anxiety dreams (van der Kolk & Saporta, 1993).

In their most developed and severe form these nightmares might present as night terrors (Marshall, 1975; Weiss, 1993). Patients who can recall them report brief terrifying images or events that appear not as part of an ongoing dream but as isolated terrifying moments. The nightmare is accompanied by extreme physiological arousal, with profuse sweating and heart rates of up to 160 to 170 per minute. Accompanying psychomotoric activity may consist of gasps, moans, screams, somnambulism, and violent attempts to ward off or escape from the feared perception (Marshall, 1975).

Traumatic dreams are seldom of the actual traumatic event itself (Miller, 1994; Weiss, 1993). It may be any dream with an unpleasant subjective experience, not just the classical nightmare with anxious awakenings (Horowitz, 1979). They tend to symbolically represent important issues related to the event, for example, betrayal, loss, or survival (Miller, 1994; Weiss, 1993). Miller (1994) differentiated between anxious dreams, which are common in the early recovery stages of the posttraumatic syndrome, and the angry dreams of a later stage. During the interval between these two stages the patient may have few or no dreams that relate directly to the event. Horrible dreams may then suddenly catch him by surprise. In other cases there may be a slower progression through the fear and anxiety dreams to the angry ones. The therapist should prepare the patient for their possible appearance (Miller, 1994).

Recurrent dreams were not very prevalent in a sample of victims of a natural disaster (Madakasira & O'Brien, 1987). On the other hand, Mollica et al. (1992) found nightmares to be very prevalent in refugees with PTSD. Nightmares were however not able to distinguish PTSD from non-PTSD patients in this sample. If these findings can be generalized to mining, where accidents are not a result of deliberate human behaviour, nightmares would also be expected to be less prevalent. In fact, Stevens, Calitz, and Gagiano (1996) found that few treatment-seeking gold mine employees with PTSD experienced nightmares.

3.1.3 Sudden acting or feeling as if the traumatic event were recurring

This criterion in the DSM-IV PTSD diagnosis includes a sense of reliving the experience, illusions, hallucinations and dissociative flashback episodes (APA, 1994).

Horowitz (1979) describes re-enactments as any behaviour that repeats any aspect of the serious life event, from minor ticlike movements and gestures to acting out in major movements and sequences. This includes enactments of personal responses to the life event, whether or not they were part of the real action surrounding the event. Re-enactments in PTSD patients may also be accompanied by vivid alterations in perception such as illusions, hallucinations and pseudohallucinations, as well as varying degrees of loss of contact with orientation to reality (Horowitz, 1993; Loewenstein, 1993).

Such unbidden images may also include "sensing" the presence of others who may have died during the traumatic incident. They may be the sources of paranormal phenomena, such as seeing or hearing ghosts of the deceased (Horowitz, 1993). This type of phenomenon was also noticed in one of the subjects of treatment-seeking gold mine employees suffering from PTSD. This subject lost consciousness after seeing a ghost in the stope where he was working. He was then taken to the medical station for treatment. Due to the strange symptom presentation he was referred for psychiatric assessment. The subject believed the spirit belonged to one of the victims of a traumatic earth-fall event in which many miners died. He was a member of the rescue team (Stevens, Calitz, & Gagiano, 1996). Illusions may be a result of the person's readiness to interpret any new stimulus as a repetition of traumatic life events (Horowitz, 1993).

Flashbacks and intrusive images or feelings are often so terrifying that the patient fears he is going crazy (Modlin, 1983). Kolb and Mutalipassi (1982) defined flashbacks as "dissociative states". They found that subjects responded with immediate time regression and re-enactment of their combat experience with intense emotional abreaction of the effects of fear, rage, indignation, sadness and guilt to a combat sound stimulus. According to Kolb and Mutalipassi (1982) flashbacks are learned behaviour or conditioned emotional responses. This

learning takes place in a dangerous environment where a need for life preserving behaviour is important. This type of symptom or "survival-dependent learned behaviour" may thus be difficult to remove (Kolb & Mutalipassi, 1982).

It was reported that flashback episodes in PTSD patients with combat experience met the criteria of panic attacks. In these cases flashback episodes were reported to be generally short-lasting, but they were followed by elevated baseline anxiety, similar to the persistent arousal found after panic attacks (Mellman & Davis, 1985). Roszell, McFall and Malas (1991) suggested that flashbacks might not be commonly found in PTSD individuals when rigorously adhering to the definition of flashbacks, which require true dissociative reactions. Therefore, not surprisingly flashbacks were uncommon in combat veterans and in victims of civil violence (Bleich, Siegel, Garb and Lerer, 1986; Loughrey, Curran, & Bell, 1993).

Although the DSM-IV (APA, 1994) mentions that hallucinations may be experienced by victims with PTSD, this phenomenon is rarely discussed in literature. In a hallucinatory experience, the person interprets inner sensations, that have no external basis, as real (Horowitz, 1993). A limited study by Mueser and Butler (1987) suggested that persistent auditory hallucinations can accompany PTSD in the absence of any gross impairment in reality testing or other psychotic symptoms. The hallucinations have been found to be typically depressive and the results suggested that cultural factors may play a role in the development of the symptom. It was found that this symptom was more likely to be reported by patients with more severe symptoms of increased arousal. Subjects with auditory hallucinations had more severe and prolonged exposure to traumatic events compared to those subjects without PTSD. Brayshaw (1991) found auditory hallucinations to be very prominent in Zulu patients exposed to severe violence. It was suggested that a combination of prolonged and intense trauma exposure,

coupled with a physiologically based heightened arousability could account for auditory hallucinations (Mueser & Butler, 1987).

Re-enactment symptoms were found to be relatively common in treatment-seeking mine employees with PTSD. The fact that these subjects continued to work in environments similar to the precipitating circumstances explained this finding (Stevens, Calitz, & Gagiano, 1996). The underground mine conditions constantly provide cues that indicate danger and with resultant heightened arousal. Mellman and Davis (1985) indicated that sensory experiences, for example, loud noises, and increased arousal could precipitate flashbacks.

3.1.4 Intense psychological distress at exposure to events

The focus here is on psychological distress in the face of a representation that symbolizes or resembles an aspect of the traumatic event (including anniversaries of the event). The emotional symptoms may include anger, fear, anxiety, a sense of impending doom (Weiss, 1993). There may also be rare dramatic outbursts of fear and panic triggered by stimuli arousing recollections of the traumatic event (de Girolamo, 1992).

Horowitz (1979) stated that victims with intense emotional distress may have "pangs of emotion" which are waves of feeling that have a quality of increasing and then decreasing, rather than being a prevailing mood or subjective tone. These emotions occur in intense waves and may be unbearable at their peak (Horowitz, 1993). Affective recall has been found to be very specific (97%) with a low sensitivity (33%) to PTSD (McFarlane, 1988c). Intensification of symptoms on exposure was found to be frequently the most persistent PTSD symptom in victims of civil violence (Loughrey et al., 1993).

3.1.5 Physiological reactivity on exposure to symbolizing or resembling events

A trauma victim may experience physiological reactivity when exposed to events that resemble or symbolize aspects of the initial traumatic event (APA, 1994). This reactivity is expressed through heavy or irregular breathing, lightheadedness, tingling in the extremities, tightness in the chest, knot in the stomach, damp or cold palms or feet, or hyperactivity in any bodily system (Horowitz 1979; Weiss, 1993). These physiological episodes frequently occur in conjunction with attempts to avoid stimuli reminiscent of the traumatic event and they can be very distressing and approach a level of arousal that is exhausting (Weiss, 1993).

Various studies have shown that PTSD is associated with elevated physiological arousal in response to audiovisual and imaginal trauma-related stimuli. Mainly heart rate (HR), blood pressure (BP, both systolic and diastolic), skin resistance (SR) level and skin conductance (SC) level, peripheral surface temperature and electromyogram (EMG) have been shown to significantly alter after exposure to trauma (combat and motor vehicle accidents) related stimuli (Blanchard et al., 1982; Blanchard, Hickling & Taylor, 1991; Blanchard, Kolb & Prins, 1991; Friedman, 1995; Lating & Everly, 1995; Malloy, Fairbank, & Keane, 1983; Orr, Lasko, Pitman, & Shalev, 1995; Shalev & Rogel-Fuchs, 1993). Heart rate has been found to be consistently the best single physiological response in terms of distinguishing combat veterans with PTSD from those without PTSD (Blanchard, Kolb & Prins, 1991) as well as victims of motor vehicle accidents with PTSD from those without (Blanchard, Hickling & Taylor, 1991). Pitman (1988) postulated that physiological responses to intrusive recollections about the traumatic event could serve as an objective marker for PTSD. A subsequent study showed an elevated physiological response to be specific to PTSD (Shalev, Orr, & Pitman, 1993). Yehuda, Southwick, Giller, Xiaowan and Mason (1992) found that the

catecholamines dopamine and norepinephrine seemed to be related to intrusive symptoms.

Psychophysiological assessment therefore offers strong potential for diagnostic identification of a subgroup of patients with war-induced PTSD (Kolb, 1987) and motor vehicle accident-induced PTSD (Blanchard, Hickling, & Taylor, 1991). It also offers possibilities for assessment of the severity of the disorder (Blanchard, Hickling, & Taylor, 1991; Kolb, 1987). Although few other trauma populations have been assessed for physiological reactivity in laboratory analogous situations, physiological arousal to traumatic cues may represent an important feature in these cases as well (Foy, 1992).

Stevens, Calitz and Gagiano (1996) found that all treatment-seeking mine employees with PTSD experienced psychological as well as physiological symptoms on exposure to reminders of the trauma, albeit to a mild degree of severity. Their continued exposure to the harsh mining conditions may have contributed both to the high response rate and the mild severity. It is possible that continued exposure to trauma-related stimuli might cause chronic elevated baseline levels. Subjects may therefore not be able to differentiate between mild and severe levels of physiological and psychological symptom intensity.

3.2 Avoidance of stimuli associated with the trauma and numbing of general responsiveness

The C-criteria of the DSM-IV PTSD is often also referred to as denial symptomatology (Horowitz, 1979). According to Everly (1993) avoidance, numbing and depressive symptomatology are secondary symptoms in response to the "core" recollective and arousal symptomatology. They are self-preserving responses to events perceived as overpowering, catastrophic and inescapable (Everly, 1993;

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Solomon, 1993). Many of the phenomena included in this set of diagnostic criteria describe the various behavioural and interpersonal strategies which can be put in place to contain the intrusive memories and emotional lability, anxiety and disturbed concentration (McFarlane, 1993).

Numbing of responsiveness may be registered as depression, as anhedonia and amotivational states, as psychosomatic reactions, or as dissociative states. It interferes with the ability to explore, remember and integrate memories, and undermines the capacity to fantasize and symbolize, all of which are essential for finding new meaning (Solomon, 1993; van der Kolk & Saporta, 1993). It can prevent the victim from absorbing and responding to vital information, resulting in a breakdown in functioning. It results in constricted affect, estrangement from other people, and an inability to sustain intimate relationships (Solomon, 1993). Results of a study by Foa, Riggs and Gershuny (1995) indicated that numbing symptoms become prevalent as avoidant, intrusive and arousal symptoms become more severe. This verified their hypothesis that avoidance strategies are aimed at reducing the distress associated with memories of the trauma. Numbing will thus occur when avoidance is ineffective in reducing arousal.

Although effortful avoidance and numbing may be functionally similar, Foa et al. (1995) proposed that separate mechanisms underlie the two phenomena and that they therefore represent separate phenomena. They also suggested that strategic psychological processes might regulate avoidance, whereas numbing may be mediated by more automatic mechanisms. They also found that numbing symptoms in general had high specificity and predictive power. They best identified individuals with PTSD.

Avoidance has a functional intent with often a dysfunctional outcome. It is intended to ward off the intrusion of trauma imagery. Although it is a more

conscious process than psychic numbing the victim has hardly more control over one than the other. Driven by fear, the victim avoids any number of stimuli, external and internal (Solomon, 1993). Avoidance reactions entail, firstly, the avoidance of situations that in some way are seen to stimulate recollection of the trauma and, secondly, an escape from situations perceived as similar to the trauma. Apart from the behavioural avoidance there is also cognitive avoidance, that is avoidance of thinking about the trauma or aspects of it (Scott & Stradling, 1992).

In contrast with the "phasic" intrusion symptoms, the avoidance symptoms of PTSD are "tonic". The "tonic" features are those that the patient manifests all or most of the time and that constitute part of his or her baseline mental functioning (Pitman, van der Kolk, Orr, & Greenberg, 1990).

In order to make a PTSD diagnosis three of the cluster C-criteria of DSM-IV PTSD must be persistently experienced by the victim of trauma. These symptoms are subsequently discussed.

3.2.1 Avoidance of thoughts, feelings, conversations associated with the trauma

Thoughts and recollections of the trauma are typical internal stimuli normally avoided by victims of trauma with PTSD. One of the main problems in the diagnosis and treatment of PTSD is created by the tendency for patients to go to considerable lengths to remove their painful and intrusive thoughts from awareness. They may not offer any information about the traumatic event (McFarlane, 1986; Miller, Kraus, Tatevosyan, & Kamenchenko, 1993; Solomon, 1993). The effects of traumatic events are therefore often not recognized. If specifically questioned these sufferers may be evasive with generalities and

denials because of the fear of being shamed and the desire to avoid the evocation of strong emotion (Green et al., 1993; Pennebaker & Beall, 1986).

Pennebaker and Beall (1986) stated that individuals who are unable to confide in others about upsetting events must psychologically inhibit their behaviours, thoughts and feelings. Over time this deliberate inhibition serves as a low level but cumulative stressor. As with all stressors, not talking to others about a traumatic event has been reported to be associated with disease (Pennebaker & Beall, 1986; Pennebaker & Susman, 1988). In fact, McFarlane (1988a) found that avoidance of thinking about a natural disaster might be the best predictor of an acute maladjustment reaction.

Avoidance may occur on a conscious level where an effort is made on the part of the survivor to actively inhibit thoughts and feelings related to the trauma. This can involve revisiting the earlier memories through flashbacks and intrusive thoughts about the incident. Avoidance may also occur unconsciously, wherein the survivor is not aware of the effort to avoid the psychological trauma associated with both physical and psychological loss. During unconscious denial issues associated with the trauma and a reconsideration of these issues is ignored. There is no allowance for revisiting the stressor or returning to the previous stages of processing this trauma (Miller et al., 1993).

In a gold mining environment it is expected that the avoidance of thoughts and feelings associated with a traumatic event would occur in most victims so as to enable a return to similar circumstances. In fact, a study on treatment-seeking gold mine employees with PTSD found that all the subjects avoided internal stimuli to a marked degree (Stevens, Calitz, & Gagiano, 1996).

3.2.2 Avoidance of places, activities, people associated with the trauma

Traumatized victims may manifest persistent efforts to avoid external stimuli, for example, activities, places, experiences, or people that are associated directly or symbolically with the trauma (APA, 1994; Miller, 1993; Solomon, 1993; Weisaet & Eitinger, 1993). An aversion to and fear of returning to the traumatic situation or any situation reminiscent of it is also labeled "traumatophobia" (Solomon, 1993).

Milne (1977) found that residents who evacuated their homes after a cyclone had devastated their homes, and who did not return afterwards, experienced more postdisaster emotional disorders than those who remained behind - therefore verifying other reports (McFarlane, 1988a; Pennebaker & Beall, 1986; Pennebaker & Susman, 1988) that avoidance is associated with maladjustment. Participation in PTSD research projects may also be affected by this phenomenon - a reluctance to participate due to avoidance of reminders of the trauma and distress at recalling the event (Green et al., 1993; McFarlane, 1993).

Stevens, Calitz and Gagiano (1996) found that all the subjects in a study on treatment-seeking gold mine employees with PTSD experienced avoidance behaviour. In fact, this symptom was also the most intensely experienced symptom of all PTSD symptoms. This seemed to be related to chronic exposure to the stressful underground mining environment. The victims were confronted daily with reminders of the traumatic event when they had to go to work.

3.2.3 Inability to recall an important aspect of the trauma

The clinical phenomenon here is that the individual is aware of important details about the event that cannot be remembered. There are gaps and

inconsistencies in the story as it is told. This type of psychogenic amnesia may be either partial or complete (Weiss, 1993). According to Scrignar (1988) amnesia seems to protect people from the dysphoric emotional effects of the trauma.

The essence of some traumatic experiences is that they leave people in a state of "unspeakable terror", which may result in an inability to recall important aspects of the traumatic experience. During such periods of stress the experience does not fit any existing conceptual schemata: it overwhelms. This precludes accommodation and assimilation of the experience into either the preoperational or operational information processing modes as described by Piaget. It leaves the experience to be organized on a sensorimotor level. Memories for these experiences are therefore difficult to retrieve, but they can be reactivated by affective, visual or auditory cues. The traumatic experience will therefore be stored in memory, but the somatosensory elements may override linguistic representation, and be expressed as anxiety attacks and panic disorders. This could also explain why children are much more prone than adults are to react to trauma on a somatosensory level (van der Kolk, 1988).

From a brain structural point of view, it is the hippocampus that is responsible for locating memory for experiences in space and time. During severe and prolonged stress the hippocampal function seems to be suppressed, resulting in amnesia in respect of the traumatic experiences and longstanding deficits in memory and behavioural learning (Southwick, Krystal, Johnson, & Charney, 1995; van der Kolk, 1988; van der Kolk & Saporta, 1993).

Although dissociation has been seen by some researchers as central in the dynamics of PTSD symptom formation, a relatively low prevalence of psychogenic amnesia and other dissociative symptoms were found in victims of a natural disaster (McFarlane, 1988c). On the other hand, psychogenic amnesia in PTSD has

been suggested to be difficult to assess, especially over long periods of time because people tend to forget what happened (Roszell et al., 1991).

Stevens, Calitz and Gagiano (1996) also reported a low rate and low intensity of psychogenic amnesia in treatment-seeking mine employees with PTSD. They also found this symptom difficult to assess and had to rely on their clinical observations of subjects rather than the self-report of the victims. Due to the fact that legal inquiries follow all the reportable mine accidents they found that subjects mostly experienced questions about memory as insulting and implicating dishonesty. They said that being insensitive in this regard could therefore have serious implications for the cooperation of mine employees in the research process.

3.2.4 Markedly diminished interest or participation in significant activities

The essential feature here is a change in level of interest subsequent to the trauma or the onset of symptoms. Activities in which interest is lost must have been meaningful to the victim prior to the trauma, as evidenced by continued interest or focus on the activity (Weiss, 1993). Solomon (1993) reported, for example, that PTSD veterans experienced a general loss of interest and energy, and exhaustion beyond any physical justification. They lost interest in their families, friends, sex and work. They experienced a general feeling that life is meaningless. McFarlane (1988c) found reduced involvement to be specific but not sensitive to PTSD.

Exposure to death and forms of horror can lead to the internalization of the reality of death in all its senselessness. It may give rise to the feeling of "What is it all for?" A widespread loss of purpose and inability to find meaning in life may develop (Solomon, 1993). In the more severe cases it may lead to an

identification with death. They live as though they are dead, denying themselves pleasure and constricting their life (Solomon 1993),

Changes in activity because of physical limitations and the severe anhedonia of someone with major depression do not meet this criterion. Therefore, if both PTSD and depression are present, a clinical determination must be made of whether the loss of interest is clearly tied to the response to trauma (Weiss, 1993). Loughrey et al. (1993) says that loss of interest in PTSD would have more of a denial quality whereas in depression it will be related to an emotional state.

The majority of treatment-seeking mineworkers with PTSD experienced this symptom. The symptom intensity was also relatively severe. Since the majority of this sample also had a major depressive disorder it may explain the reason for its intensity (Stevens, Calitz, & Gagiano, 1996).

3.2.5 Feeling of detachment or estrangement from others

The symptom "marked increase of feelings of estrangement, distance and detachment", should only have started after the traumatic event to be marked as present in traumatized victims (Weiss, 1993). Victims with feelings of estrangement experience a loss of control on the course of lives. This leads many of them to position themselves at either extreme of the dependence-independence continuum. This means that many trauma victims either become intensely dependent on their caregivers with a loss of personal initiative, or they take a counter dependent stance with a lack of involvement with others, often accompanied by an excessive involvement in work.

The traumatized people generally have difficulty in modulating intimacy (van der Kolk, 1988). Lack of emotional involvement in actual relationships diminishes

the meaning of life after the trauma, thus further perpetuating the central role the trauma plays in their lives (van der Kolk, 1988). It is the social withdrawal that contributes most to impairment (WHO, 1992b). Solomon (1993) found that estrangement derived partly from unfounded beliefs that people who had not undergone the trauma could not understand their experience.

McFarlane (1988c) found that estrangement was relatively uncommon in a group of fire-fighters with PTSD. In fact this group reported a sense of increased communal identity and involvement. These observations raised the possibility that the prevalence and quality of some of the phenomena of PTSD, for example estrangement, may be influenced by the nature of the traumatic event (McFarlane, 1988c). Orner (1993) found, for example, that alienation was one of the symptoms that differentiated PTSD veterans from the non PTSD veterans of the Falkland War, a stressor of human design.

The majority of treatment-seeking mineworkers with PTSD experienced feelings of detachment and estrangement. All these subjects also developed depression after the PTSD, which could have affected the prevalence of these symptoms. (Stevens, Calitz, & Gagiano, 1996). The fact that mine employees are constantly exposed to severe working conditions as well as the absence of a stable social support network could mean that most mine employees experience this symptom in any case. Further research in this regard is therefore indicated.

3.2.6 Restricted range of affect

The restriction of affect or "numbing" is relative to the range of affect available prior to the trauma. These victims experience themselves as being unable to have loving feelings (Weiss, 1993). Numbness refers to a present subjective sense of not having feelings, or of feeling "benumbed." It includes a

sense that one is not having potential emotions (Horowitz, 1993; Horowitz & Kaltreider, 1995). According Kinzie and Fleck (1987) numbing behaviour can be directly seen in the interview. They found that the victim with a restricted range of affect might be unresponsive to the therapist's support and empathy.

A biochemical disturbance has been associated with affect restriction. Pitman, Orr, Van der Kolk, Greenberg, Meyerhof and Mougie (1990), for example, found an association between psychic numbing and opioid-mediated stress-induced analgesia.

Psychic numbing was not prevalent in survivors of a natural disaster (Madakasira & O'Brien, 1987). Affect numbing appeared, however, to be specific but not sensitive to PTSD in survivors and fire-fighters of a disastrous Australian bush fire (McFarlane, 1988c). These symptoms were, however, experienced by the majority of a group of treatment-seeking PTSD mineworkers (Stevens, Calitz, & Gagiano, 1996). The treatment-seeking nature of this group may be one of the reasons for the high prevalence of constricted affect in these gold mine employees. It could thus be expected that traumatized mine employees not seeking help may not yet experience high levels of numbing.

3.2.7 Sense of a foreshortened future

One of the most devastating effects of trauma on adults is the tendency for them to permanently change their view of life. This includes their orientation toward the future and a sense of foreshortened future (Pynoos & Nader, 1989). Foreshortened future is often difficult to differentiate from the hopelessness associated with depression. This may therefore lead to a lessened likelihood of a positive assessment for this item (Roszell et al., 1991). This symptom is to be distinguished from chronic lack of regard for future consequences from someone with antisocial personality disorder (Weiss, 1993).

In torture victims the existential dilemma may be a dominant feature and may be the most difficult to overcome. The purpose of existence itself is challenged by the fact of torture (Turner & Gorst-Unsworth, 1993). An absence of reports on this symptom in victims of natural disasters may relate to the nature of the traumatic event. Natural disasters usually have a brief duration and may therefore have less chronic existential implications for survivors. Mine accidents however, are always a risk for underground workers, whether they result from seismic activities or human error. This may therefore explain the high prevalence rate of this symptom in the group of treatment-seeking gold mine employees. The majority of them experience a sense of foreshortened future (Stevens, Calitz, & Gagiano, 1996).

3.3 Persistent symptoms of increased arousal

The arousal of the central nervous system and the autonomic nervous system is viewed by many authors as central in the physiology of the post trauma syndrome. They propose that hypersensitivity and arousal within the anatomical boundaries of the limbic system stand to define anatomically and physiologically the condition known as PTSD (Everly, 1993; 1995b; Kolb, 1987; van der Kolk & Saporta, 1993). Sleep disturbance, hyperstartle responses, irritability, and related symptoms are clear evidence of the neurologic hypersensitivity and hyperarousal constituency with PTSD (Everly, 1993).

Symptoms of hyperarousal were the most frequently endorsed and the most severe items reported by veterans of Operation Desert Storm at one month and at six months (Southwick, Morgan et al., 1993). Hyperarousal symptomatology were also frequently reported by PTSD survivors of a tornado (Madakasira & O'Brien, 1987). McFarlane (1988c) found that the D-criteria were highly (94% to 100%) and much

more specific in distinguishing criminating PTSD subjects from non-PTSD subjects. Shalev (1992) suggested that theory might lead to hyperarousal being considered as a potential predictor of PTSD. According to Pitman, van der Kolk et al. (1990) this category of PTSD symptoms comprises a mixture of tonic and phasic symptoms. Insomnia and hypervigilance are examples of tonic symptoms, whereas the exaggerated startle response is an example of phasic symptoms.

At least two of the following cluster D PTSD symptoms must be persistently experienced before the PTSD diagnosis can be made (APA, 1994).

3.3.1 Difficulty in falling or staying asleep

Several studies, as summarized by Friedman (1995), show disruption of sleep architecture in PTSD. The disturbed sleep might include increased sleep latency, more awakenings, less total sleep time, and less rapid eye movement (Friedman, 1995; Kaminer & Lavie, 1988; Fullerton et al., 1992). This is exemplified by increased stage 1 and stage 2 sleep, decreased delta sleep and diminished REM sleep. PTSD patients have been found to be very sensitive to nonspecific auditory stimuli that provoke autonomic arousal accompanied by nightmares about traumatic experiences. This has resulted in the assumption that PTSD is essentially an arousal disorder (Kinney & Kramer, cited in van der Kolk & Saporta, 1993, p.30).

Solomon (1993) says that the inability of victims to stem intrusive thoughts could be one reason for the disturbed sleep. At other times difficulty in sleeping may reflect the efforts of victims to avoid dreaming about the trauma. Another reason for the sleep disturbance may be related to chronic physiological hyperarousal.

Schlosberg and Benjamin (1979) hypothesized that acute partial sleep deprivation is an important predisposing factor to breakdown. Later on, in a longitudinal investigation of a factory fire, Weisaeth (1989a) found that sleep disturbance in close proximity to the disaster were the best predictors of long-term disorder.

Sleeping disturbances also seems to be very prevalent in traumatized gold mine employees. For example, the majority of a group of treatment-seeking mineworkers with PTSD experienced disturbed sleeping symptoms with severe intensity (Stevens, Calitz, Gagliano, 1996).

3.3.2 Irritability or outbursts of anger

The term irritability permits a distinction between outward irritability and inward irritability. Pretrauma anger expression should however be taken into account when scoring this item. Most PTSD patients have a problem with outward irritability. Outward irritability can have negative effects on relationships, leading to a diminution of support from people with whom the patient has significant relationships, which in turn increases the likelihood of depression. Inward irritability may lead to self-mutilating behaviour and suicide. There is considerable overlap between the concept of outward irritability and the concept of anger. Anger is nearly a universal precursor for aggression (Scott & Stradling, 1992).

Survivors may carry a burden of inexpressed anger against all those who remained indifferent and failed to help (Herman, 1995). There may be rare dramatic, acute bursts of aggression triggered by stimuli arousing a recollection of the trauma (de Girolamo, 1992; Scrignar, 1988; Strange & Brown, 1970). The ultimate aim of such aggression has been described as the relief of pent-up fury rather than paranoid self-defence (Solomon, 1993).

Actual physical violence is rare (Scrignar, 1988; Solomon, 1993). Violence, when an expression of PTSD, usually has a dissociative stereotyped quality, as if a former event were being re-enacted (Atkinson, Henderson, Sparr, & Deale, 1982). According to Solomon (1993) aggression is also exploited to attain control over the environment. Aggressive episodes are more likely to occur and, usually towards a family member, when the patient is experiencing undue stress or is under the influence of alcohol or drugs (Scrignar, 1988).

Different types of anger also seem possible, for example, between survivors of an industrial disaster and victims of torture. The aggression in victims of torture was found to be a direct reaction to the violence they had suffered. In the industrial disaster angry feelings only developed after some time and then as a neuroasthenic irritability secondary to long-standing anxiety and long-lasting sleep deprivation (Weisaeth, 1989b; Weisaeth & Eitinger, 1993).

Symptoms of irritability and anger outbursts were experienced by most of the treatment-seeking mine employees with PTSD, but with low levels of intensity (Stevens, Calitz, & Gagiano, 1996).

3.3.3 Difficulty in concentrating

According to McFarlane (1993) trouble in concentrating is primary in the cycle of PTSD symptoms - therefore rejecting suggestions by Horowitz (1986) that posttraumatic phenomena fall on the two polarities of intrusion and avoidance. Difficulty in concentrating is to some extent a function of intrusive images and thoughts, that may interfere with cognitive tasks, and that allow attention to wander, such as reading (Weiss, 1993).

Accumulated evidence indicates the central role that noradrenaline and locus coeruleus activity play in the process of attention. The disturbance of concentration and hypervigilance may thus be a manifestation of this abnormality of noradrenaline production (McFarlane, 1993).

McFarlane (1993) based his hypothesis - that concentration might be a central phenomenological abnormality in PTSD - on earlier findings. Trouble in concentrating and disturbance of attention was found to be the only symptom experienced significantly more commonly by the chronic PTSD group in comparison with a non-PTSD group of fire-fighters. It was also the one symptom that predicted the continued presence of PTSD three years later. Disturbance of concentration was found to be highly specific to PTSD and to distinguish more precisely between the group of fire-fighters with and without PTSD (McFarlane, 1988c). PTSD survivors of a tornado also frequently reported disturbance of concentration (Madakasira & O'Brien, 1987).

Stevens, Calitz, and Gagiano (1996) also found that a group of treatment-seeking mineworkers with PTSD experienced concentration problems. Problems with concentration in underground mining circumstances could put the lives of workers as well as co-workers at risk. An inability to concentrate and differentiate between noises and signs that may indicate danger could be fatal.

3.3.4 Hypervigilance

When hypervigilance is experienced it means that excessive attention is given to external stimuli beyond that called for, given a realistic appraisal of the level of external threat (Weiss, 1993). Hypervigilance is a state in which the person is excessively alert, overly scanning the surrounding environment, too aroused in the sense of perceptual search, tensely expectant, or more driven toward

obtaining stimuli than normal (Horowitz, 1979; Scott & Stradling, 1992). Everly (1993) argues that the recollective processes of the B-criteria of the DSM-IV for PTSD in combination with the hyperarousal function create a state of hypervigilance and constant readiness to protect the individual against any situation that may resemble the traumatic incident.

According to Weiss (1993), this item should be differentiated from the generalized suspiciousness in a person with longstanding paranoid trends or paranoid personality disorder.

The study on treatment-seeking mineworkers with PTSD also found that the majority experienced symptoms of feeling on guard (Stevens, Calitz, & Gagiano, 1996). This symptom can however be a misnomer in the underground mining environment, because a sense of alertness is being called for in all underground employees. Controlled studies and careful assessment of premorbid levels of alertness is therefore required in evaluating these symptoms in mine employees.

3.3.5 Exaggerated startle response

Increased startle response is among the cardinal features of PTSD (APA, 1994). Its specification as a feature of PTSD appears to have derived primarily from clinical impressions (Orr et al., 1995). Horowitz (1979) describes startle reactions as flinching after noises, as unusual orienting reactions, blanching, or otherwise reacting to stimuli that usually do not warrant such responses.

Auditory startle response and acoustic startle response studies in which elementary stimuli that are not associated with the traumatic event, and for which previous conditioning is unlikely to have happened, have been conducted. Results of these studies suggest that in addition to the "conditioned emotional

response" an alteration of CNS responsiveness to elementary stimuli exists in PTSD. The results further suggest that PTSD subjects suffer from a defect in their capacity to effectively appraise intensive but redundant stimuli and to adequately regulate their arousal response. Such a defect clarifies the pervasive nature of hyperarousal observed in PTSD, which can be triggered by stimuli that bear no direct associative links with the trauma. The startle response thus represents an unconditioned type of phasic reactivity. Since the neuronal circuit of the auditory startle response is under direct modulatory effects of mesocortical structures (for example, amygdala) that are responsible for stimulus evaluation, memory and arousal, it reflects potential impairments in such structures (Orr et al., 1995; Shalev & Rogel-Fuchs, 1993).

A few studies suggest that abnormal startle response might be a trait marker of PTSD and that such a trait may predispose the individual to strong conditioning. The presence of a negatively valenced emotional state in PTSD could be responsible for the increased startle response. This trait may then place those who possess it at higher risk for developing PTSD on exposure to trauma (Orr et al., 1995; Shalev & Rogel-Fuchs, 1993).

Stevens, Calitz and Gagiano (1996) found that the majority of treatment-seeking PTSD mineworkers experienced startle responses with moderate levels of intensity.

3.4 Distress or impairment of functioning

The person with PTSD experiences an inability or difficulty in performing normal life activities such as work, family responsibilities, and social/recreational activities (APA, 1994; Davidson et al., 1991; Green et al. 1993; McFarlane, 1993; Scrignar, 1988). The impairment of functioning seems to be the automatic consequence of the onset of avoidance and numbing symptomatology.

The avoidance symptomatology initially serves an adaptive process but it also becomes a source of distress and regret (McFarlane, 1993).

Because this disorder is often chronic, it may well be that 50% of the PTSD population has continued difficulty with symptoms related to trauma (Vargas & Davidson, 1993). The general functioning of Norwegian concentration camp survivors was, for example, significantly more affected years later than that of the average population. Concentration camp survivors changed their jobs more frequently, they had a higher mortality, they were less successful in their professional life, and they were found to be more frequently and severely ill than the general population (Weisaeth & Eitinger, 1993). Similar trends were suggested for victims of combat-related stress. PTSD could influence the combat victim's mental fitness, reduce motivation and undermine reliability in security assignments and ability to participate in future wars. In civilian life the effects of PTSD may be expressed in functional disturbances in the family and at the workplace (Solomon, 1990; 1993).

However, Green et al. (1993) found no difference between a non-PTSD group and a PTSD group of motor vehicle accident survivors with regard to the abilities of subjects to return to work. They did find that the PTSD group had significantly greater levels of disability in the areas of social interaction, alertness, and emotional functioning. In a 50-year prospective study of World War II veterans, Lee, Vaillant, Torrey, and Elder (1995) also indicated that the distress of PTSD symptoms does not necessarily produce disability. Green et al. (1993) found it difficult to compare the PTSD victims who did not return to work (due to the psychiatric disorder) with the non-PTSD victims who also did not return to work (due to a physical impairment). They suggested that a measure of disability be developed that compares a patient's current functioning against that which would be clinically anticipated for his or her injury (Green et al., 1993).

Amongst the most widely mentioned PTSD symptoms that interfere with work functioning are memory and concentration problems, hostility and sleep difficulties (Solomon, 1993). McFarlane (1988c) found that the validity of PTSD as a diagnostic category was supported by the finding that the question, "Do your thoughts and feelings cut across or interfere with your life?" had a sensitivity of 78% and a specificity of 97%.

In mining a severe form of impairment is when victims avoid returning to the underground environment. It has serious implications for both the employer as well as the victim. The employee with PTSD does not always state his reason for avoiding underground work and will thus often present with psychosomatic complaints. In fact, 60% of a group of treatment-seeking mine employees presented with psychosomatic symptoms. Only 50% presented with avoidance to return to the underground environment. The costs of misdiagnosing these employees could eventually accumulate significantly, to the disadvantage of the mine. On the other hand, suffering from PTSD has serious existential implications for the migrant gold mine employee. He faces the risk of being repatriated without any financial benefits. This may leave a whole extended family without a source of material support (Stevens, Calitz, & Gagiano, 1996).

3.5 Associated psychological symptoms

Literature suggests that extreme stress and trauma may engender a wide variety of symptoms not limited to the DSM-IV criteria (APA, 1994; Everly, 1995b). The DSM-IV lists a number of clinical features that are frequently associated with PTSD but that are not considered essential to making the diagnosis. Associated mental disorders are also identified in the DSM-IV. Guilt feelings, selfblame, self-destructive behaviour, shame, hopelessness, impaired relationships,

personality change, somatic complaints, dissociative symptoms, and cross-cultural manifestations have been identified as features that received special emphasis as associated PTSD symptoms in literature. These symptoms are subsequently discussed.

3.5.1 Guilt

Sonnenberg (1988) emphasized the importance of guilt in determining PTSD. He suggested that PTSD could be described simply as a disease of guilt. The sufferer may feel guilty for causing the event, or for surviving when others did not (Roth & Newman, 1995; Sonnenberg, 1988; Williams, 1993). He may feel guilty for what he did to survive, for his inability to prevent a tragedy happening to someone else. To overcome his guilt feelings he may continually think about event hoping that he may identify reasons for not needing to feel guilty (Solomon, 1993; Sonnenberg, 1988; Williams, 1993). This vicious circle may lead to aggressive impulses, and this may cause a different set of guilt feelings - feeling guilty for being aggressive (Solomon, 1993).

Perceptual impressions that may have developed during the trauma give the survivors and rescue workers a false impression that there was more that they could have done to change the possible consequences (Fullerton et al., 1992; Williams, 1993). According to Lifton (1968) guilt is associated with both physical and emotional proximity - thus, the relationship between the survivor and the deceased. The closer the survivor is to the person who has died, the stronger the guilt, and the more distant the relationship the less intense the guilt (Lifton, 1968).

According to Loughrey et al. (1993), guilt may also be a function of the type of trauma. According to Weisaeth and Eitinger (1993), guilt is less common in

survivors of natural disasters and it becomes more severe as the trauma becomes more "man-made". Survivor guilt has been noted in various types of trauma related to human failure, for example, the Buffalo Creek flood (Erikson, 1976), the atomic bombing of Hiroshima and Nagasaki (Lifton, 1968), and fire-fighters participating in a horrific air disaster rescue operation in Sioux City (Fullerton et al., 1992). However, guilt was uncommon in Southeast Asian refugees (Kinzie, 1993) and Zulus exposed to severe violence (Brayshaw, 1991). Low frequency survivor guilt was found in compensation-seeking PTSD survivors of civil violence (Loughrey et al., 1993).

Results of a prospective study on the phenomenology of PTSD in Israeli soldiers have shown an unexpected low prevalence of guilt. Guilt was experienced by less than 20% of the PTSD subjects. Less than 10% of the PTSD subjects without a breakdown during the traumatic event had guilt feelings (Solomon, 1989). In fact, the author mentions that the subjects criticized them for posing the questions, maintaining that they had acted as best as they could under the circumstances. In this study it was assumed that when survival is tentative, a matter of luck, then guilt is less readily developed (Solomon, 1993).

Survivor guilt was also not prevalent in a group of treatment-seeking mineworkers with PTSD. On the other hand, guilt feelings secondary to other psychodynamic symptoms, for example, anger, fear of dying and thoughts to leave the mine were present in the majority of these mine employees with PTSD. At the core of most of these themes (for example, fear to die) were the conflict subjects experienced with regard to their responsibility of financial support to the extended family. They were confronted with two alternatives which created secondary guilt feelings and impasse: i) they either had to make the decision to leave the mine and be responsible for the resulting financial consequences this would have on the family, or ii) return to underground work and "risk their

lives" again with, if they should die, the same financial consequences. Kinzie and Fleck (1987) also found a fear of dying to be common in subjects suffering from PTSD. These miners had families with children and were concerned about what would happen to them should they die in the mines. The African value system rejects humanistic self-centered lifestyles. According to Mbiti (1975) it is only in terms of other people that the individual becomes conscious of his own being, his own duties, his privileges and responsibilities towards himself and towards other people. Whatever happens to the whole group happens to the individual. Therefore making decisions to the detriment of and without consulting the group in favour of egocentric needs creates conflict and anxiety.

Although guilt feelings are still included as an associated symptom of PTSD they have been removed from the DSM-III-R and DSM-IV PTSD diagnostic criteria (APA, 1987; 1994).

3.5.2 Selfblame and blame

The attribution of responsibility for disasters or victimization ranges from scapegoating and attempts to assign blame to others to the tendency to assume personal responsibility for what has happened to them (Baum, 1987).

Selfblame is a common response in victims of trauma. Janoff-Bulman (1995) emphasized two distinct types of self-blame, labelled as "behavioural selfblame" and "characterological self-blame". The former involves blaming one's behaviour for a negative outcome such as rape, whereas the latter involves blaming one's character or enduring qualities. The important difference between these two attributes involves the perceived controllability of the factor(s) being blamed. For example, the rape victim may blame herself for walking alone at night, a case of behavioural selfblame and thus a greater sense of controllability.

Characterological selfblame involves self-esteem deficits and is the type of selfblame generally associated with depression (Janoff-Bulman, 1995).

Self-doubt is of special importance in understanding duty-related trauma. This is characterized with the self-questioning of "Did I do the right thing?" Without examining step-by-step their role in the event, the employees might not be able to successfully reappraise their actions. Failure to process adequately the nature of the individual's role in the trauma may lead to continuing symptoms of anxiety and depression (Williams, 1993).

Blaming others for one's own victimization is more likely when more conventional explanations are not sufficient to account for what has happened, when moral conduct can be questioned, when feelings of fear and guilt require expression, and when there is a perceived need to force responsible officials to act to prevent future traumatic events (Baum, 1987). Scapegoating and blaming others appear to occur most often in the case of calamities caused by human error. When someone is seen to have acted against the norms and values of set community standards for his or her own benefit (for example, rape), there is a trauma of human design. In the case of trauma due to human failure (for example, motor vehicle accidents), blaming can also occur. In the case of natural disasters, natural forces are usually seen as responsible for death, destruction and disruption, in which case blaming will seldom occur (Baum, 1987).

The attribution process requires explanation of events in ways that maintain a sense of order and it provides some predictive power. When events are unpredictable, as is usually the case in accidents or disasters of human design, attributing responsibility to others creates some feelings of predictability. The need to attribute responsibility for victimization also appears to be associated with perceived control and the victim's desire to maintain control over his/her

situation when it appears such control has been lost (Baum, 1987; Scurfield, 1993). Blaming others has been found to be associated with poorer physical and emotional outcome than behavioural self-blame is (Tarrier, 1995).

In the South African gold mines the disabling and reportable mine accidents must, as a matter of law, be reported to the Inspector of Mines (Pretorius, Act 50 of 1991). For the purpose of identifying the cause of an accident the Inspector then investigates all accidents. When accidents are a result of human error the guilty party faces a penalty consonant with to the nature of the accident. These legal inquiries after mine accidents have a psychological healing value, and ensure high safety standards. The inquiry procedures almost act as a form of debriefing, forcing all witnesses to relate their stories of the accident.

However, the period prior to hearings is unfortunately often characterized by attributing blame and denying guilt. Due to the severe pressure on delivering production, miners may take shortcuts and ignore certain safety standards. The hierarchical management structure of the mines then often leads to the misdirection of blame with the team leader blaming the miner, the miner blaming the shift boss and so forth. These inquiries therefore provide good opportunities to develop procedures in which trauma counsellors could participate in the inquiry process in a preventative mode.

3.5.3 Self-destructive behaviour

Internalization of anger may result in malignant self-hatred and chronic suicidality (Herman, 1995). Scignar (1988) however, claims that thoughts about suicide and death are not common, but, if present, are indicative of depression. Similarly Loughrey et al. (1993) found suicidal behaviour to be surprisingly low

in PTSD victims of civil violence but four times greater in regard to those without such a diagnosis. Davidson et al. (1991) reported that PTSD subjects were nearly 15 times more likely to attempt suicide than all non-PTSD subjects. Moore and Boehnlein (1991) found no successful suicides over a 6 year period in Indo-chinese refugees with PTSD and major depression. It can thus be concluded that suicidal behaviour is not common in PTSD victims. If present it would suggest the presence of a comorbid depression.

3.5.4 Shame

Shame over helplessness and over aggressive impulses is one of the common themes of posttraumatic stress reactions of trauma survivors (Horowitz, 1976). Shame has been reported mainly in literature on combat veterans, refugees and sexually abused women.

It is possible that the type of shame experienced by Israeli soldiers could also apply to migrant mineworkers. Shame is often experienced by soldiers suffering breakdowns during combat. They feel shame about the PTSD symptoms which they find difficult to control. Contact with successful soldiers points to their own weaknesses and intensifies the shame. This leads to victims going to great lengths to keep their mental state from friends, colleagues and family (Solomon, 1990; 1993). These soldiers lose trust in themselves, knowing that their powers have failed them in a moment of crisis. With this knowledge of their own failings they are more apprehensive of the weakness and egocentricity of others. They fear that others might judge them as adversely as they judge themselves, causing them not to trust anyone anymore (Solomon, 1993). These casualties must come to terms with the fact that they failed in a time of crisis. The consequences of their failure includes low self-esteem, shame, and a fear of social rejection. A

radical loss of self-esteem is a secondary effect that contributes to the prolongation of the distress of the casualty (Solomon, 1993).

A sense of shame was found to be consistently present over time in South-East-Asian refugees (Boehnlein, Kinzie, Ben, & Fleck, 1985; Kinzie, 1993). Shame was found to continue in most Cambodians, even when receiving treatment. The shame did not seem to be related to the mental status of victims but rather to the severity of the stressor and their culturally acceptable coping style (Boehnlein et al., 1985).

Shame was found to be very common in treatment-seeking mine employees with PTSD. The shame was experienced with high levels of intensity. These miners were mainly ashamed of their inability to prevent the accident. They were also ashamed of being caught unawares by the accident (Stevens, Calitz, & Gagiano, 1996).

3.5.5 Hopelessness

Traumatized people develop a disorder of hope. They seem to have difficulties in knowing what are appropriate or inappropriate demands. They seem to be unable to appropriately assess their own or other's contributions to interpersonal tension, and they often see many social interactions as further victimization (van der Kolk, 1988). A feeling of helplessness is often described by victims as the feeling of someone else have absolute power over them. This feeling can be generalized beyond the actual moments of the event (Roth & Newman, 1995).

A feeling of helplessness is a permanent feature of generalized vulnerability, an awareness of death in the mind of the victim (Solomon, 1993). Pessimistic ruminations are characteristic in the chronic phase. Lack of interest, energy and hope are also indicative of the presence of a mood disturbance (Scrignar).

3.5.6 Impaired relationships

The PTSD symptoms which interfere most with social reintegration are numbing of responsiveness and reduced involvement in the external world, diminished interest in significant activities, feelings of detachment or alienation, and constricted affect. In addition, the PTSD victim's level of hostility and his trauma induced depression and phobias can together or separately influence the different communicative aspects of husband, father, friend and son and sometimes breadwinning responsibilities in the case of males (Solomon, 1988b; 1993).

PTSD has been found to be associated with a decline in social activities. The worse the PTSD symptoms, the worse the social functioning (Escobar, Randolph, Puente, et al., 1983; Solomon & Mikulincer, 1987). In fact, PTSD casualties have been reported to be emotionally unavailable for their families and friends, reluctant to talk, and sexually disinterested (Caselli & Motta, 1995; Carrol, Rueger, Foy, & Donahoe, 1985; Friedman, 1981; Solomon, 1988b; 1993; Solomon, Mikulincer, Freid & Wosner, 1987).

Researchers have found that there are more problems in the families of war veterans with PTSD than in families of veterans without PTSD. This process where the symptoms exhibited by family members due to the effect a member with PTSD has on them is called secondary victimization (Solomon, 1988b; 1993; Solomon, Mikulincer, Freid & Wosner, 1987). In the families of veterans with PTSD the wives were significantly less happy and satisfied, more marital problems and family violence occurred, and the children of these families had more behavioural problems compared with children of families of war veterans without PTSD (Caselli & Motta, 1995; Kulka, Schlenger, Fairbank, et al., 1990; Solomon, 1988b; 1993). The wife may take over most of the responsibilities for the effective functioning

of the family. She has to adjust her functioning and may feel responsible for her husband's mental health. A vicious cycle may develop in which she sacrifices too many of her own needs and this may lead to a build-up of frustration and strong aggressive feelings (Escobar et al., 1983; Solomon, 1988b).

The circumstances of South African mine employees from the rural areas is comparable with the description given by Solomon (1988b) about the circumstances of Israeli families during wartime. Family members have good reason to be worried about their loved ones. Questions such as "Is he dead, injured, is he safe?" are common. The family's anxiety is exacerbated by media coverage about developments. The family does not have direct communication with the soldier and often does not even know where he is. The result is that the moods of the family members tend to vacillate rapidly, especially after an incident in which detailed information is unknown. Roles change during the time in which the father conducts military service. The mother takes up the responsibilities which were previously borne by the father (Solomon, 1988b). Similar circumstances exist for families of South African mine employees. They seldom go home to visit, work in dangerous settings, and regular media coverage is given about accidents and fatal injuries. In the rural areas amputated and paralyzed victims are constant reminders of the dangerous environment in which the father and/or husband works. The wife takes up most of the roles of the husband and is supported by members of the extended family. It is thus possible to assume that when a mine PTSD victim returns home because of medical unfitness or on his own accord due to fear of the dangerous circumstances, phenomena similar to those experienced by Israeli families can be expected.

3.5.7 Personality change

The tenth edition of the International Classification of Diseases (WHO, 1992a) introduced the concept "Enduring Personality Changes" which includes personality change resulting from catastrophic experience without pre-existing vulnerability. Personality changes such as becoming avoidant, hostile, distrustful or hopeless are described by this category (WHO, 1992a). Therefore, personality change may represent chronic sequelae of PTSD in individuals who no longer meet the criteria for PTSD (Scrignar, 1988; Vargas & Davidson, 1993).

The exact nature of described changes in personality due to trauma, varies. At one extreme there is some form of paranoid adjustment to life. At the other extreme are those who appear to have made a normal adjustment, but whose dealing with recurrent thoughts or images reduces the energy they have available for work and relationships. Common in most of the trauma victims is that their images of fairness and stability of the world appear to be severely disrupted. Consequently they are forced to devote time and energy to adjust to the emotional disturbance this causes. This adjustment is regarded as probably responsible for the reported personality changes occurring after the onset of PTSD (Reich, 1990).

Though personality or character changes are reported in all kinds of trauma it is especially chronic man-made trauma that tends to have an effect on the identity of victims. These types of trauma either effect the development of personality as in the case of child abuse, or they are instrumental in breaking the identities of victims, for example, those in captivity. The first-mentioned leads to personality disturbances, for example multiple or borderline personality disorders. Subjects who have been in captivity or taken hostage report on feeling different and not being the same as before (Herman, 1995). Personality styles of suppression and denial have been found to characterize the current adjustment of

negatively-affected prisoner of war subjects (Engdahl, Speed, Eberly, & Schwartz, 1991).

3.5.8 Somatic complaints

Physical symptoms are often a major focus of complaints and the main reason for people with chronic PTSD consulting their family doctors (de Loos, 1990; McFarlane, 1988c; Solomon, 1988c; 1993, Solomon, Mikulincer, & Kotler, 1987). To experience emotional distress primarily as physical symptoms and to express it in somatic terms is a widespread, normal phenomenon in many cultures. Survivors usually accentuate their physical complaints when they seek help. Many of them do not understand the underlying cause of their problem and are not always aware that they are suffering emotional distress (de Loos, 1990; Kroll, Habenicht, Mackenzie et al., 1989; McFarlane, Achison, Rafalowicz & Papay, 1994; Scrignar, 1988; Solomon, 1988c; 1993; Solomon, Mikulincer, & Kotler, 1987).

McFarlane and associates (1994) postulated a number of reasons for increased reporting of physical symptoms by persons with PTSD. Firstly, physical symptoms may be an integral part of the constellation of symptoms that make up PTSD. Traumatized people generally have a poor tolerance for arousal. They have a decreased capacity to modulate physiological arousal. Lacking a conscious understanding about the reason for the intensity for these reactions, which are out of proportion to the severity of the current stressors, they then lack verbal or symbolic control over their reactions. This may leave them vulnerable to experience subsequent stresses primarily as somatic states. The somatic reaction may take the form of psychosomatic symptoms and panic attacks (McFarlane et al., 1994; van der Kolk, 1988). This results in a reluctance in these subjects to listen to alternative explanations for their physical discomfort (Scrignar,

1988). In this regard McFarlane et al. (1994) found general practitioners misdiagnosing PTSD cases because of the to physical complaints by the victims.

Secondly, physical symptoms may otherwise be directly caused by the stressor responsible for the development of PTSD, as in the case of a physical injury (McFarlane et al., 1994). The significance of the physical symptoms is easy to miss due to the possibility that they relate to the injury being the primary diagnostic assumption, particularly if the symptoms are musculoskeletal of nature. This can lead to prolonged exaggerated physical disability as well as under-diagnosis of PTSD (de Loos, 1990; Diamond & Maliszewski, 1990; McFarlane, 1994; Solomon, 1993). Residual scars and consequences of the injury may also serve as reminders of the incident. In this way intrusive memories about the event may be triggered with a subsequent onset of other PTSD symptoms. These symptoms in return may negatively affect the remaining physical symptoms of the injury (Scrignar, 1988; Turner & Gorst-Unsworth, 1993).

Thirdly, physical symptoms may also relate to comorbid diagnosis (Diamond & Maliszewski, 1990; McFarlane et al., 1994; Moore & Boehnlein, 1991). High levels of PTSD comorbidity exist with anxiety, depressive and alcohol abuse disorders. All syndromes commonly present with physical symptoms either as physical concomitants of the disorder or via somatization. The authors found that subjects with PTSD complaints were more likely to have a comorbid diagnosis of major depression which could account for certain physical symptoms in PTSD. Specific symptoms, largely headaches and back pain, were related to the comorbid diagnosis of major depression (McFarlane et al., 1994; Moore & Boehnlein, 1991; Scrignar, 1988). In panic disorder and generalized anxiety disorder, for example, specific physical symptoms are related to the disorders and often the focus of the patient's distress and cause for consultation (McFarlane et al., 1994). According to Scrignar (1988) pathologic anxiety either initiates or accentuates the somatic

symptoms. A higher risk has also been found in PTSD subjects in regard to psychosomatic diseases such as bronchial asthma, hypertension and peptic ulcers (Davidson et al., 1991; Gleser, Green, & Winget, 1981; McFarlane et al., 1994).

Finally, premorbid factors such as personality may be important in the development or expression of physical symptoms. Patients may therefore have a form of "alexithemia" which interferes with their ability to appreciate the emotional aspects of their illness which may predispose them to present their distress in somatic forms. Neuroticism, for example, has been implicated in somatization and may thus account for the development of such symptoms in some traumatized individuals (McFarlane, 1994).

Somatization may also be a cultural expression of underlying mental health problems. Somatization formed the central organizing concept for both the subjective experience and social communication of distress in four Asiatic ethnic groups (Kroll et al., 1989; Moore & Boehnlein, 1991). The culturally related interpretation of certain experiences also contributes to the perception of symptoms. A typical example was quoted by Kroll et al. (1989) in which a subject lost much blood when his fingers were shot off during combat. This subject refused to work because he believed he was permanently weakened because of the loss of blood during the incident. He believed he was too fatigued and weak to hold a job and he believed, despite explanation to the contrary, that the blood could never be replaced (Kroll et al., 1989).

With regard to the mining industry, Stevens, Calitz and Gagliano (1996) also found that in a group of treatment-seeking employees with PTSD the majority presented with psycho-somatic symptoms. However, in the follow-up in-depth assessment of symptoms they found that the subjects experienced less somatic anxiety than psychic anxiety. This contradiction between presented and evaluated

symptoms were thought to be related to method of evaluation and also to the perceptions of these non-Western patients about Western treatment. They may perceive Western health as somatically orientated and therefore may present their complaints somatically. No interpreters were used during the assessment and vague responses about symptoms could easily be clarified (Stevens, Calitz, & Gagiano, 1996).

When patients constantly complain of endogenous sensations, this predicts a poor prognosis. A fixation on somatic symptoms in lieu of objective physical findings prevents the patient's acceptance of therapeutic principles which can ameliorate or resolve PTSD (Scrignar, 1988).

3.5.9 Dissociative symptoms

Both the DSM-III-R (APA, 1987) and the DSM-IV (1994) state that dissociative states, that can last from a few seconds to several hours or a few days, are rare in PTSD. The DSM-IV does not even mention PTSD victims to be more liable to have a dissociative disorder (APA, 1994). Various other studies reported insignificant prevalence of dissociative symptoms (Feinstein, 1993; McFarlane et al., 1994; Mollica et al., 1992). In Indo-Chinese refugees two possible reasons have been put forward for a low prevalence of dissociative symptoms. The first is that dissociative symptoms may not be present in Indo-Chinese refugees, or, alternatively, the concept was - it being difficult to translate - not translated correctly into Indo-Chinese cultural terms (Mollica et al., 1992).

According to Spiegel, Hunt and Dondershine (1988) many of the PTSD symptoms are dissociative of nature. They even suggested that dissociative symptoms were more prominent than anxiety-related symptoms in PTSD. Numbing of emotions, flashback episodes or re-enactment of the traumatic event, and inability to recall

important aspects of the trauma are however, the only dissociative phenomena referred to in the PTSD criteria of the above-mentioned manuals (APA, 1987; APA, 1994). The fact that at least three criteria of the cluster C PTSD symptoms should be experienced by the individual before a diagnosis can be made, emphasizes the additional weight given to dissociation since the DSM-III-R (APA, 1994).

Dissociative phenomena are commonly experienced by individuals during and/or shortly after the traumatic episode (APA, 1994; Herman, 1995; Spiegel & Cardena, 1990; Spiegel et al., 1988). This has led to the inclusion of Acute stress disorder in the DSM-IV in which dissociative symptoms form the primary criteria to make such a diagnosis (APA, 1994). Survivors of trauma with dissociative experiences showed distinctive and higher symptom levels as well as more severe PTSD (Hyer, Albrecht, Boudewyns, Woods, & Brandsma, 1993).

Through the practice of dissociation, whether it is voluntary thought suppression, minimization or sometimes pure denial, people learn to alter an unbearable reality (Herman, 1995; Spiegel & Cardena, 1990). Although these dissociative defences help preserve the integrity of an ego that is being overwhelmed by an intolerable traumatic episode, they may prevent or delay the person's coping with the traumatic experience, thus producing post traumatic numbing and other symptomatology. Due to the dissociative process the traumatic experiences are kept out of awareness, and are therefore not integrated and not processed within more ordinary and contextual and reflective modes of conscious awareness (Spiegel & Cardena, 1990). Therefore the identity is divided in a powerful way and the person comes to feel that there is an inauthentic self which carries on the everyday functions of life but with a sense of numbing, a lack of genuine pleasure in otherwise pleasurable activities. The unconscious, warded-off memories exert censorship on conscious experience. The process of dissociation

becomes part of the person's identity and is activated when the individual is exposed to new stressors or situations that symbolize the initial trauma (Spiegel et al., 1988).

4. DIFFERENTIAL DIAGNOSIS

PTSD, as defined by the DSM-IV, is only one possible outcome of traumatization (Davidson, Swartz, Storck, Krischnan, & Hammet, 1985; Lating, Zeichner, & Keane, 1995; McFarlane, 1993; Scrignar, 1988; van der Kolk, 1988). Various studies reported that only between 2 and 31 percent of PTSD subjects have PTSD as their only diagnosis (Escobar et al., 1983; Green, Lindy, & Grace, 1985; Roszell et al., 1991). Part of the complication in accurately assessing PTSD is this high frequency of Axis I and Axis II comorbidity in PTSD patients (Friedman, 1990; Lating et al., 1995; Scott & Stradling, 1992).

According to Davidson (1995) differential diagnosis includes the need to rule out other psychiatric disturbances for example, mental disorder due to a general medical condition such as head trauma, substance-induced disorder, brief psychotic disorder and major depressive episode. Davidson (1995) emphasized the importance to establish that symptoms appearing immediately after trauma are not merely an exacerbation of a pre-existing mental disorder.

The DSM-IV (APA, 1994) says that in PTSD the stressor must be of an extreme nature, whereas in adjustment disorder the stressor can be of any severity. The diagnosis of adjustment disorder is appropriate both for situations in which the response to an extreme stressor does not meet the criteria of PTSD and in situations in which the symptom pattern of PTSD occurs in response to a stressor that is not extreme, for example, being dismissed from one's work.

The DSM-IV (APA, 1994) also states that not all the psychopathology that occurs in individuals exposed to an extreme stressor should necessarily be attributed to PTSD. When the symptoms of avoidance, numbing and increased arousal are present before exposure to the stressor the DSM-IV indicates that they do not meet the criteria for the diagnosis of PTSD and that consideration of other diagnoses (for example, mood disorder or another anxiety disorder) are then required. Moreover according to the DSM-IV, if the symptom response pattern to the extreme stressor meets criteria for another mental disorder (for example, brief psychotic disorder, conversion disorder, major depressive disorder), these diagnoses should be given instead of, or in addition to, PTSD.

Acute stress disorder (ASD) is distinguished from PTSD because the symptom pattern in ASD must occur within 4 weeks of the traumatic event and resolve within that 4-week period. If the symptoms persist for more than 1 month and meet the criteria for PTSD, the diagnosis should be changed from ASD to PTSD (APA, 1994; Koopman, Classen, Cardena, & Spiegel, 1995).

The DSM-IV (1994) indicates that the intrusive thoughts of an obsessive compulsive anxiety disorder are experienced as inappropriate and not related to an experienced traumatic event. The DSM-IV also differentiates the flashbacks of PTSD from illusions, hallucinations, and other perceptual disturbances that may occur in schizophrenia, other psychotic disorders, mood disorder with psychotic features, a delirium, substance-induced disorders, and psychotic disorders due to a general medical condition.

Because PTSD can be easily simulated, malingering should be strongly suspected in combination with a medicolegal context of presentation, presence of a antisocial personality disorder, lack of cooperation during clinical assessment,

and marked discrepancy between the person's claimed stress or disability and the objective findings (APA, 1994; Hyler, Williams, & Spitzer, 1988; Scrignar, 1988).

It can be concluded from the reviewed literature, that little disagreement exist about major depression (Faustman & White, 1989; Kroll et al., 1989; Kinzie, Boehnlein, Leung, Moore, Riley, & Smith, 1990; Kudler, Davidson, Meador, Lipper, & Ely, 1987; Moore & Boehnlein, 1991; North, Smith, & Spitznagel, 1994; Scrignar, 1988; Shore et al., 1986; Solomon, 1993), and anxiety in general (Davidson, Kudler, Saunders, et al., 1990; Engdahl et al., 1991; Rubonis and Bickman, 1991) as comorbid disorders in chronic PTSD. The onset of these two syndromes appear to be different and they also seem to have a different pathogenic relationship with PTSD.

Stevens, Calitz and Gagiano (1996) found that all the treatment-seeking mine employees with PTSD suffered from comorbid major depression, which developed secondary to the PTSD. According to them it appeared that employees with PTSD would only seek help once secondary symptoms, such as depression, developed in response tot the PTSD. Findings by Engdahl et al. (1991) support the hypothesis that depression is a late manifestation of being chronically ill with PTSD. Stevens, Calitz and Gagiano (1996) found that all subjects in a sample of treatment-seeking mine employees with PTSD received elevated scores, which represented major anxiety disorders, on the Hamilton Anxiety Rating Scale.

The prevalence of comorbid substance abuse disorders differs from study to study, some finding a high prevalence (Davidson, Swartz et al., 1985; Faustman & White, 1989; Hryvniak & Rosse, 1989; Sierles, Chen, McFarland & Taylor, 1983), whereas others found no significant association (Breslau et al., 1991; Green, Lindy, Grace, & Gleser, 1989; Loughrey et al., 1993; North, Smith, & Spitznagel, 1994; Rundell, Ursano, Holloway, & Silberman, 1989).

Fourie and Stevens (1992) evaluated the incidence of psychiatric disorders at a mine hospital in the Free State goldfields. They found that 43% of the psychiatric out patients suffered from an alcohol or cannabis related psychiatric disorder. According to van der Linde (1997) alcohol is far and away the favourite drug in the mining industry, and with little doubt also a very significant contributor to employee illness and injury. Results of a survey conducted by van der Linde (1997) at two hostels of a Free State gold mine indicated that 32% of participants experienced psychosocial problems related to alcohol, suggesting alcohol dependence.

Although PTSD may be highly suspected in the gold mine industry, little evidence exists as to its real prevalence. The high prevalence of substance abuse disorders (43%) that was found at an out patient psychiatric clinic for mine employees raised various questions. One of these questions was whether the substance abuse pattern was a form of self medication for underlying PTSD in these treatment-seeking mine employees (Fourie & Stevens, 1992). Knowledge of PTSD and its comorbid concomitants in mine employees would assist in ensuring effective diagnosis and treatment.

The substantial differences between studies about the frequency of comorbid disorders associated with PTSD may be a reflection of research methods, subject population and various other factors. The point is, however, that multiple diagnosis may be part of the syndrome that is described by chronic PTSD. The distortion created by looking only for PTSD as the outcome of trauma affects clinical diagnosis, research design, and a patient's expectations (Ursano, 1987). It is therefore important that useful investigations must control for the likely co-occurrence of other psychiatric disorders which will contribute to an effective treatment plan (Friedman, 1990). A multi-axial approach to the

assessment of PTSD, in which multiple assessment measures are used before conferring the PTSD diagnosis, are therefore advocated (Horton, 1995; Keane, Caddell, & Taylor, 1988; Lating et al., 1995). Since PTSD has long been challenged on the grounds of its seeming overlap with other diagnoses, this comprehensive multimethod approach was found to be very successful and reliable in the discrimination and identification of a PTSD group from control groups (Malloy et al., 1983; Wolfe & Keane, 1990).

In the South African gold mining industry it would be of primary importance to report with scientific accuracy on the nature of PTSD to be able to motivate implementation of preventative programs. Differentiating PTSD from other medical syndromes is therefore important.

5. CLINICAL COURSE OF PTSD

The onset of a disorder follows the trauma immediately or with a latency period which may range from a few weeks to months (de Girolamo, 1992). The response to the trauma is usually characterized by an initial period of outcry followed by either intrusive and denial or avoidance states, possibly interchanging with one another, not in a prescribed pattern but with a phasic tendency (Horowitz, 1993; Horowitz & Kaltreider, 1995). Over the longitudinal course the symptom picture can fluctuate and vary independently over time (APA, 1994; de Girolamo, 1992; Ursano, 1987; Vargas & Davidson, 1993; WHO, 1992b). PTSD patients may be described as having severe, moderate or mild forms of the disorder. (Kolb, 1987).

PTSD has an acute course (when the duration of the symptoms is less than 3 months) and a chronic course (when the duration of the symptoms is 3 months or more). Delayed onset PTSD is diagnosed when the symptoms remain latent and if its onset is at least 6 months after the stressor (APA, 1994). McFarlane (1988b)

identified seven different patterns of morbidity in the course of PTSD. This suggested that the definition of acute, chronic, and delayed-onset PTSD's may be an arbitrary generalization based on clinical experience and could require further refinement (McFarlane, 1988b).

The course of emotional and behavioural reactions to trauma, namely, the response to trauma, the acute phase, the chronic phase, PTSD with delayed onset, reactivated PTSD and partial PTSD are subsequently reviewed.

5.1 Stage I - Response to Trauma

The intensity of the initial physiological response to trauma is the most significant predictor of long-term outcome (Scrignar, 1988; Solomon, 1993; van der Kolk, 1988; Weisaeth & Eitinger, 1993). The "response to impact" is often distinguished from the "immediate aftermath" (WHO, 1992b).

During the impact of the traumatic event one or more of the five senses are stimulated, which activates the autonomic nervous system and related stress mechanisms, producing symptoms of anxiety (Scrignar, 1988). The body's "fight and flight" response alerts the individual to such a degree that there usually is an intense focus on the trauma - similar to "freeze framing" every millisecond of the trauma. The freeze framing may be associated with perceptual distortion in the form of time expansion or time acceleration. This extreme focus on the event could result in fixing beliefs about the event, and if these beliefs are for some or other reason distorted, a psychological and physiological tunnel vision and subsequent emotional problems may result. The person may, for example, believe that he could have done more to prevent the event and start to develop guilt feelings (Williams, 1993).

Disorganized flight behaviour is common, whereas brief psychotic reactions occur only in a small minority (WHO, 1992b). In some cases the casualty is unable to handle his anxiety with a resultant loss of self-control and lack of mastery (that is, weeping, vomiting, diarrhoea [Hibler & Duncan, 1983; Scrignar, 1988; Solomon, 1989]). Solomon (1989) found that subjects who responded with a psychological breakdown during the trauma were more vulnerable to develop intense chronic PTSD.

Subsequent to the trauma, patients may complain of sleep disturbances, bad dreams, pain, nervousness, irritability (Fullerton et al., 1992; Hibler & Duncan, 1983; Scrignar, 1988). In severe cases these symptoms can continue for more than one month in which case a diagnosis of acute PTSD can be made (APA, 1994; WHO, 1992b). Anxiety symptoms persist through all three stages of PTSD, but are more obvious during stage I (reponse to trauma) and the earlier part of stage II (Scrignar, 1988; WHO, 1992b). Rising or persistent anxiety towards the end of the first week after the incident indicates the risk of a serious disorder developing (McCloy, 1992). Moderate symptoms seem to have a higher tendency to improve than severe ones (Weisaeth & Eitinger, 1993). The physical symptoms of anxiety may be the starting point of a somatization process (WHO, 1992b).

The response to trauma and the response shortly after the traumatic incident are often also characterized by symptoms of dissociation (APA, 1994; Baum, 1987; Scrignar, 1988; Spiegel & Cardena, 1990). When the dissociative phenomena, for example, numbing of responsiveness, derealization, depersonalization, dissociative amnesia, are accompanied by typical re-experiencing symptoms, avoidance behaviour, symptoms of anxiety and increased arousal, and they continue for more than two days, a diagnosis of acute stress disorder can be made according to the DSM-IV (APA, 1994).

Rescue workers may have a different response pattern because they are usually not present during the trauma impact. Four types of responses were reported in rescue workers, namely, feelings of helplessness and guilt in cases where the lives of victims could not be saved, fear of the unknown, identification with the victims and physiological reactions. Fatigue and physical exhaustion, aspects not often measured, were the norm in groups of rescue workers (Fullerton et al., 1992). Humour is also being referred to as a common response in rescue workers following exposure to the dead and the dying. It provides an emotional sharing of the experience and also serves as an expression of membership in the rescuer group. Humour therefore establishes the boundaries between the rescuers and those outside the group, resulting in a shared closeness and alliance between group members, which may be important in the process of recovery. This group closeness however, may also interfere with sharing outside the group (Fullerton et al., 1992).

For most, trauma only produces temporary discomfort and inconvenience and time usually heals (Baum, 1987; Scrignar, 1988; WHO, 1992b). By 10 weeks there is usually a significant drop of symptoms with a gradual decrease continuing over the first year (Raphael, 1986). Vulnerable persons predisposed to PTSD or those subjected to an overwhelming trauma move on to stage II (Scrignar, 1988).

5.2 Stage II - Acute phase

When symptoms related to the trauma intensify or persist beyond one month, the patient is in the acute phase of PTSD (APA, 1994; Scrignar, 1988). Although most PTSD symptoms may be experienced by an individual with acute PTSD, some symptoms are more prominent during the acute phase (Scrignar, 1988).

Anxiety symptoms are more obvious during the early part of this phase. Anxiety symptoms do not recede but are maintained or increased due to environmental stressors, thoughts related to the incident or tension and other physical symptoms. Intrusive, re-experiencing memories, obsessive concern for the traumatic incident characterize phase II and are more prominent than symptoms of avoidance, withdrawal and psychic numbing (Scrignar, 1988; Solomon, 1989). McFarlane (1986) found sleep disturbance and nightmares to be more common in the acute phase of PTSD and they dissipated as the disorder become more chronic.

It has been suggested that high levels of distress and arousal one month after the traumatic event are markers of vulnerability to chronic symptoms (Green et al., 1993; Solomon, 1993). Southwick and Morgan et al. (1993) found that hyperarousal symptoms were the most severe and frequently endorsed symptoms during the acute phase, followed by intrusive memories in Operation Desert Storm veterans.

If the patient is unable to return to work it is a bad sign as it affects finances and may lead to a role reversal within the family, which is not conducive to harmonious family relationships. As marital satisfaction wanes so does the frequency of sexual intercourse. Addiction to alcohol and other substances usually begins during stage II (Scrignar, 1988).

The somatic manifestations of anxiety, together with any symptoms due to physical injury, focus the attention of patients on their bodily processes and increase the anxiety once again through a spiral process. During the latter part of this phase they may become organically orientated even without objective medical support. Towards the end of phase II patients may become concerned with chronic disability and litigation due to poor treatment may result (Scrignar, 1988).

Stevens, Gagiano and Calitz (1996) found that treatment-seeking gold mine employees with acute PTSD experienced the symptoms more intensely than those with chronic PTSD. This could be accounted for by the absence of a stable support network (the family) soon after the traumatic event. The subjects in their study were mostly migrant workers from the rural areas.

5.3 Stage III - Chronic phase

In a small portion of subjects, the PTSD condition may manifest a chronic course over many years and a transition to an enduring personality change (World Health Organization, 1992). The symptoms experienced during Stage II continue and worsen as time passes. Changes in lifestyle and status result from impaired functioning and affect family, social and recreational activities (Scrignar, 1988).

The chronic symptoms wax and wane over time. Three chronic PTSD groups were identified in fire-fighters between 4 months and 29 months after a disaster: 1) persistent chronic group; 2) resolved chronic group; 3) recurrent chronic group. The chronic groups were not symptomatic at all three sampling frames. This emphasized the fluctuating nature of symptoms in the chronic group (McFarlane, 1988b).

Contradictions exist with regard to the prominence of intrusive symptoms during the chronic phase of PTSD. Some studies found intrusive symptoms to be more prominent during both the acute and chronic stages of PTSD, whereas others found intrusive symptoms to decrease over time. It seems however, that in subjects with a prior history of breakdown during the trauma, intrusive symptoms continued to receive a stronger endorsement than the avoidance symptomatology. On the other

hand, most studies agree that avoidance and numbing of responsiveness symptomatology become more salient during the latter stages of the syndrome (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989). Green et al. (1993) suggested that avoidance and numbing may only emerge later as defence strategies to deal with the other PTSD symptoms.

Some studies have indicated the prevalence of hyperarousal symptoms over other PTSD symptoms (Southwick & Morgan et al., 1993; Desivilya, Gal & Ayalon, 1996). Hyperarousal symptoms, specifically hyperalertness, were found to be the most prominent symptom 17 years after a terrorist assault (Desivilya et al., 1996). Concentration problems were found to be the only symptom separating the chronic PTSD group from the resolved PTSD group of fire-fighters (McFarlane, 1988c). Sleep disturbances also continues, but nightmares become less frequent (Gleser et al., 1981; Scrignar, 1988).

According to Scrignar (1988), an obsessive concern with the disability attributable to the trauma predominates during stage III. The chief complaint of the patient may be pain or physical discomfort. The somatic manifestations of anxiety, when misinterpreted by patients, hinder treatment and may lead to frustration and dudgeon. Although disability is a hallmark in chronic PTSD, litigation does not lag far behind. Patients may become frustrated with the poor results of treatment and develop a desire to be compensated for the negligence of others, resulting in preoccupation with legal action. Treatment is retarded when patients begin to concentrate on forensic matters. Chronic patients may become disillusioned with medical treatment, whilst the clinicians become upset with patients who do not respond to treatment, resulting in a referral or refusal to continue with therapy (Scrignar, 1988).

Comorbid anxiety disorders often develop during the chronic phase of PTSD. Anxiety symptoms similar to those of general anxiety disorder are also prevalent in chronic PTSD. The onset of symptoms coinciding with trauma distinguishes PTSD from general anxiety disorder, phobias and panic attacks that often develop subsequent to chronic PTSD (Davidson et al., 1991; Engdahl et al., 1991; McFarlane, 1988c; Scignar, 1988).

Secondary depression has been found to be very specific to chronic PTSD (Engdahl et al., 1991; McFarlane, 1988c; Scignar, 1988). It was found that the anxiety symptoms may diminish over years but that depressive symptoms increased as a reaction to chronic impairment (Engdahl et al., 1991).

Addiction to alcohol and other psychoactive substances may become malignant during phase III and may completely obscure other signs and symptoms of PTSD (Gleser et al., 1981; Scignar, 1988).

The majority of treatment-seeking mine employees with chronic PTSD had severe injuries. The frequency and severity of avoidance and intrusive symptoms were almost the same for the subjects with chronic PTSD (Stevens, Gagiano, & Calitz, 1996). Three possible reasons for so few "not injured chronic PTSD" mine employees have been proposed. One reason might be that non-injured mine employees with chronic PTSD have no physical reason (an injury) to motivate transfer to less dangerous work places and they could therefore have left the mines because of the fear of returning to underground employment. It is therefore possible that a few non-injured employees with chronic PTSD are still employed in the mines. A second reason might be that non-injured employees with acute symptoms recover spontaneously without developing chronic PTSD. A third explanation may be the fact that some of these patients develop chronic symptoms but continue to present with psychosomatic symptoms at medical departments or traditional healers and

consequently receive symptomatic treatment. The authors proposed that these assumptions be investigated (Stevens, Gagiano, & Calitz, 1996).

To conclude, it therefore seems that chronic PTSD is characterized by an increase of cluster C PTSD symptomatology and an increased proneness to associated depression. Somatization, disability claims and phobic anxiety also seem to be common consequences of chronic PTSD.

5.4 Delayed onset

According to the DSM-IV, delayed onset PTSD may only be diagnosed when the onset of PTSD symptoms occurred at least 6 months after the traumatic incident (APA, 1994). Delayed onset PTSD has been described among World War II veterans, survivors of concentration camps, Vietnam veterans, Israeli soldiers, and survivors of the Buffalo Creek disaster (Grace, Green, Lindy, & Leonard, 1993; Solomon, 1993).

The previously labelled Delayed Stress Response Syndrome (Figley & Sprenkle, 1978), now delayed onset PTSD (APA, 1994), remain delayed due to, as was suggested, the "Denial Numbing Tendency" - a defensive coping mechanism (Figley & Sprenkle, 1978). It is engendered by the individual's inability to face the initial and subsequent guilt, fear and revulsion of the traumatic experience. Therefore the person enters a Latency Period without any assistance. The Latency Period is the time when the victim experience a sense of relief and well-being, with the bad memories successfully suppressed. During this period, it is suggested that the victim's defences, which were so pronounced following the initial traumatic event, are reduced. This places him or her in a vulnerable psychic state for resurrection of memories related to the trauma (Figley & Sprenkle, 1978).

Reactivation of latent or delayed onset stress may be precipitated by any event simulating the original trauma or ordinary personal and family stresses (for example, marriage, the birth of a child, divorce, the death of a loved one, retirement, physical illness, bereavement, the anniversary of the traumatic event [Christenson, Walker, & Ross, 1981; de Girolamo, 1992; Figley & Sprenkle, 1978; Herrmann & Eryavec, 1994; Kinzie & Fleck, 1987; Solomon, 1993]). Burgess Watson, Hoffman and Wilson (1988, p.16) emphasized that "... all that is required is the right perceptual response (which may be to a purely symbolic trigger), so that an individual many years after satisfactory coping with extreme stress may suddenly break down ...".

According to Scignar (1988), delayed onset PTSD can be misapplied when a person has encountered two separate and discrete traumas at two different periods of time. An individual subjected to two different traumas can develop PTSD on each occasion. Cautiousness must be exerted before applying the label "delayed onset" because of the implication that all subsequent stress symptoms are directly related to the original trauma (Scignar, 1988).

Doubts have been raised as to the validity of the diagnosis of delayed onset PTSD (Pary, Turns & Tobias, 1986; Pynoos & Nader, 1989; Shore et al., 1986; Solomon, 1993; Sparr & Pankratz, 1983). Furthermore, it is argued that the time lapse is not usually a true latency period because of the presence, in most cases, of unacknowledged and untreated residual symptoms. It is rather a delayed identification of existing PTSD symptomatology than delayed onset symptomatology (Scignar, 1988; Solomon, 1993; Sparr & Pankratz, 1983). In Vietnam veterans, for example, the real delay was the acceptance by the government of the traumatic effects of war on the combat soldier and prisoner of war. Furthermore, ashamed

and afraid, many Vietnam veterans neither sought nor considered their symptoms and behaviour to be pathologic.

According to de Girolamo (1992), the only in-depth study which assessed this problem was conducted by Solomon, Kotler, Shalev and Lin (1989). Solomon et al. (1989) found that only 10% of the sample they have studied could be diagnosed as suffering from genuine delayed onset PTSD. The majority of the remaining 90% were found to be cases of delayed help-seeking (40%) following either chronic PTSD, or the exacerbation of subclinical PTSD (33%), or the reactivation of a previous combat-stress reaction (17%).

In a 14-year follow-up of Buffalo Creek Disaster victims, Grace et al. (1993) identified 10% delayed onset PTSD victims. The psychological and social adjustment of delayed PTSD veterans was also found to be significantly better than that of the immediate onset PTSD veterans (Solomon, Mikulincer, Waysman, & Marlow, 1991). On the other hand, Laufer, Gallops and Frey-Wouters (1984) found that more than half of the PTSD soldiers whom they have studied experienced onset more than a year after they had been discharged. McFarlane (1988b) reported delayed onset PTSD in 20% of subjects involved in a fire disaster but, broken down, only 3% had persistent PTSD after the delayed onset - that is between 6 and 29 months after the trauma. The symptoms of the rest remitted again. This data suggests that a range of outcomes may exist in the delayed onset group.

Solomon et al. (1989) gave various explanations for the low frequency delayed cases in their sample of Israel combat veterans compared to the Vietnam and World War II samples. Factors like social contexts in which the traumatic events took place, the use of drugs and alcohol by the different samples and the opportunity to mourn given to the different population samples, have been put forward by these authors. The use of drugs can, for example, temporarily suppress the acute

stress reaction leaving the person more exposed to later delayed onset PTSD. An environment conducive to opportunity for mourning, on the other hand, can assist in preventing delayed onset PTSD (Solomon et al., 1989).

None of the treatment-seeking gold mine employees with PTSD evaluated by Stevens, Calitz and Gagiano (1996) were found to suffer from delayed onset PTSD. It was rather a matter of delayed identification and delayed help-seeking which prevented the chronic PTSD cases from being diagnosed sooner.

Solomon et al. (1989) concluded that much still has to be learned about the types of triggers, the variability of the latency period and the real prevalency rates of delayed onset PTSD after a longer period of time.

5.5 Reactivated PTSD

Reactivated PTSD refers to the re-experiencing of a previous episode of PTSD following renewed exposure to similar traumatic events or a variety of other life stressors (Solomon, 1990; 1993). Little is known about reactivation and the DSM-IV makes no mention of reactivated PTSD. Empirical study is difficult because few people are exposed to similar stressors more than once. When victims do sustain reactivated PTSD they are not always aware of the original source of their second stress reaction. Therefore, although there is ample evidence of reactivation of stress disorders little is known about its course and precipitating factors or its clinical picture (Solomon, 1993).

Solomon (1990) conducted an extensive study on reactivated PTSD and described four types of combat-related reactivated PTSD.

Firstly, **Uncomplicated reactivated PTSD**, refers to subjects who recovered fully from the previous PTSD. These individuals have a high level of functioning before developing a full-blown episode due to renewed exposure to battle.

Secondly, **Specific sensitivity reactivated PTSD** refers to victims with minor and diffuse symptoms after the previous PTSD episode who are able to succeed in their overall professional and social functioning. These individuals display selective sensitization in that specific stimuli reminiscent of the original trauma retain the power to reactivate PTSD. In these instances reactivation of a residual or sub-clinical PTSD to a full-blown PTSD syndrome may occur without any intense combat exposure.

Thirdly, **Moderate generalized sensitivity reactivated PTSD** subjects may have recurrent acute stress reactions to stimuli only remotely related or apparently unrelated to the original trauma. These individuals continue to suffer from PTSD symptoms with subsequent intense suffering. The group studied by Solomon (1990) reported anxiety, sleep disturbances, nightmares, restlessness, irritability, and uncontrolled outbursts of anger and other PTSD symptoms in civilian settings and intensification of these symptoms in reserves. Despite efforts to attain mastery, including avoidance behaviour and the use of substances, they continue to experience anxiety and distress. According to Solomon they may develop a full-blown PTSD following minor military stimuli.

Finally, **Severe generalized sensitivity reactivated PTSD** refers to those patients who are completely unable to function in any setting (Solomon, 1990). Solomon (1990) found that 23% of the sample belonged to the first-mentioned category, 50% to the second, 9% to the third, and 19% to the last-mentioned.

Reactivated PTSD differs from first-time PTSD in that victims of the former have more severe pathology which manifests itself in a significantly higher rate of intrusive thoughts and imagery, a higher overall level of psychiatric distress, and a diminished level of social functioning (Solomon, 1990; Williams,

1993). The study by Solomon (1990) also indicated that reactivated PTSD sufferers experienced more anticipatory anxiety with regard to participation in another war. Their expectation of being able to cope positively was also lower.

Solomon (1993) attributed Seligman's learned helplessness theory to reactivated PTSD victims. Learned helplessness occurs when an individual is exposed to adverse conditions that he cannot escape or control. It entails the conviction derived from that experience that one has little influence over the environment. The person who has been exposed to more than one traumatic incident is thus confronted more than once with the knowledge of how little mastery he/she possesses. Solomon (1990) found that reactivated PTSD sufferers tend to attribute their problems largely to external factors, for example, the situation in which they found themselves, and their familial and social network.

According to Solomon (1993), reactivated trauma is worse than the original because the second traumatization is compounded by the residues of the first, which, lingered on in many cases, even in those individuals who recovered superficially. "The reactivated casualty has to contend with not one failure but two - with two sets of appalling memories, guilt stacked upon guilt, rage upon rage, and stress upon stress (Solomon, 1993, p.208)". Reactivation leaves a deeper imprint on all areas of the casualties' lives than a single trauma (Solomon, 1993).

This analysis shows that reactivation is a multiform phenomenon. The four groups mentioned above represent various points of the pathology/recovery spectrum that is part of the natural course of PTSD. These points serve as an index to which the initial trauma has, or has not, been contained and adapted to. These points are not necessarily a step by step course of recovery or

deterioration. Progress from one stage to the other may differ for each individual (Solomon, 1993).

6. SUMMARY

The prevalence of PTSD in high-risk populations seems to vary, depending on the timing of the assessment and the nature of involvement in the trauma. Prevalence rates seem to be higher in populations directly involved in trauma compared to those who only witnessed or heard about the traumatic events. Most studies indicate that the prevalence of PTSD decreases over time.

This literature review on symptoms and signs of PTSD offers little information on the symptom profile of PTSD in the mining industry. Results of the study conducted by Stevens, Calitz and Gagiano (1996) provide data on a population of treatment-seeking mineworkers. These results are thus not a reflection of a population of underground mineworkers. The results do however indicate that mineworkers experience most of the symptoms of PTSD as are suggested by the DSM-IV.

It appears that a high frequency of DSM-IV (APA, 1994) Axis I and Axis II comorbidity exists in individuals with PTSD. The three most commonly described disorders that comorbide with PTSD are, however, general anxiety disorder (Davidson, Kudler, Saunders, et al., 1990; Engdahl et al., 1991), major depressive disorder (Kinzie et al., 1990; Moore & Boehnlein, 1991) and alcohol abuse (Green, Lindy, & Grace, 1985; Helzer, Robins, & Davis, 1976; Scrignar, 1988; Solomon, 1993). It is therefore indicated that future studies on PTSD should check for major depression, anxiety and substance abuse.

PTSD is described to have a variable course. It seems that this course depends largely upon exposure to new stressors or other etiological factors. Furthermore, the clinical picture of this syndrome also varies as the disorder progresses over time. Severe pathology seems to be associated with chronic PTSD.

The next chapter reviews literature on the pathogenesis of PTSD. This may provide insight into the variable nature of PTSD as discussed above.

CHAPTER 5: THE PATHOGENESIS OF PTSD

1. INTRODUCTION

The etiology of PTSD combines the interaction of many factors, including predisposing, modulating, precipitating and posttraumatic factors. No model of the cause of PTSD would be complete unless it took into account these pretrauma (personal vulnerability), trauma (stressor characteristics), and post trauma variables (Andreassen, 1985; Davidson, 1995; Everly, 1995a; Flach, 1990; Kinzie, 1989). The role of these factors in the etiology of PTSD is subsequently discussed.

2. THE STRESS FACTOR

PTSD is one of only a few disorders in the DSM-IV that is defined by its cause. Without a stressor the disorder cannot exist. In PTSD a designated category of stressors is linked, in an essential way, with a distinct configuration of symptoms (Breslau & Davis, 1987b; Davidson, 1995). Green (1993) emphasized that the measure of stressors must be made as objectively and as detailed as possible and questions must be asked about each aspect separately. It is important to determine what happened during the traumatic event itself, what objectively occurred to the person in terms of life threat, loss, and other aspects related to the role of the stressor, as well as the role the person played in the event (Green, 1993). Since the stressor is a cardinal criterion in the PTSD diagnosis, features of traumatic events are subsequently discussed.

2.1 Definition of a traumatic event

There has been considerable disagreement on what constitutes a traumatic event. In the DSM-III and DSM-III-R (APA, 1980; 1987) emphasis was placed only on the magnitude of the stressor which led to distinctive psychiatric sequelae. The emphasis was thus only on external variables, such as stressor severity and degree of traumatic exposure (Wolfe & Keane, 1990). This has led to ambiguity and confusion in the interpretation of the stressor criterion (Breslau & Davis, 1987b; Green, 1993; Keane, 1985; McFarlane, 1990; 1993). The DSM-IV (APA, 1994) attempted to solve this problem by providing clearcut criteria to define a traumatic event. Three factors are salient in the DSM-IV's definition of a traumatic event.

The first is the **nature of the experience**. The victim may either have direct personal experience of an event, or he/she may have witnessed the event, or he/she may have learned about an event.

The second factor involves the **nature of the event** itself. The DSM-IV states that when the event was witnessed or experienced it should involve actual or threatened death or serious injury or other threat to a person's physical integrity. When a person learns about the event, the event, additionally, must be unexpected or violent and result in serious harm specifically to a close associate of the traumatized person, for example, a friend or family member (APA, 1994).

The third factor relates to the **response of the person** to the event. The response to the event must involve intense fear, helplessness or horror, or in children the response must involve disorganized or agitated behaviour (APA, 1994). "Terror" is thought to be related to the proximity of victims to the

physical effects of the disaster, for example, the destruction of homes and/or the collapse of buildings or bridges. "Horror" is possible whenever death, injury, or disfigurement is involved (Baum, 1987).

Scrignar (1988) conceptualized the "traumatic principle" to provide a reference for deciding whether an event is traumatic. According to Scrignar the "Traumatic Principle" must be applied to separate the truly traumatized from others.

Scrignar (1988, p.13) described it as follows:

The "Traumatic Principle" is: any environmental stimulus which poses a realistic threat to life or limb, impacting on one, or more likely a combination of the five sensory pathways to the brain, if perceived as a serious threat to one's life or physical integrity, whether it produces physical injury or not, can be regarded as a trauma and precipitate a PTSD in a vulnerable individual.

The central factor, according to Scrignar (1988), is whether the trauma poses a realistic threat to life or limb and a person is consciously aware and has a full appreciation of the potential for serious injury or death to self or others. Sufficient time is necessary for the traumatic event to be impressed on the person's mind. A natural consequence following exposure to the traumatic event, is an intense activation of one's autonomic nervous system. A neurophysiological response to the trauma must eventuate before a PTSD can develop. How the event is perceived by the person via one of his five senses would thus determine whether a stress disorder will develop. High levels of autonomic activity at the time of the trauma concentrate the victim's perception of danger so that the "video tapes of the mind" become vivid and unforgettable (Scrignar, 1988). Van der Kolk (1988) also indicated that a stressor only becomes traumatic when it overwhelms both psychological and biological coping mechanisms (van der Kolk, 1988). The

application of the "Traumatic Principle" assists in the diagnostic evaluation by eliminating those disorders which do not fulfil this basic criterion (Scrignar, 1988).

2.2 Types of trauma

Stressors producing PTSD are usually categorized as follows: 1) deliberately caused disasters or disasters of human design, 2) natural disasters and 3) man-made disasters due to human failure or accidents (APA, 1995; Janoff-Bulman, 1995; Scrignar, 1988; WHO, 1992b). Green (1993, p.136) conceptualized the types of events along a continuum of deliberateness or causality:

"At one end are those events which are completely natural, over which persons have no control (e.g., a tornado). In the middle of the continuum would be those events that would be categorized as resulting from "error", or "mishap" (e.g., a toxic waste spill). The upper end of the continuum would include events that were deliberately perpetrated with an intent to harm (e.g., assault, rape)".

A homogeneity of symptoms has been perceived for the different groups of trauma. Different types of trauma can, for example, trigger different perceptions about them, which in turn may trigger a more or less severe form of PTSD symptom development. For example, the specific emotional patterns of adjustment to man-made violence are different to those of natural events (de Girolamo, 1992; Scrignar, 1988). A subdivision of PTSD into groups according to communality of stressors has emerged over time, for example, "rape trauma syndrome" and "Vietnam combat neuroses" (Scrignar, 1988).

Stressors of human design include being victimized by a known individual or being victimized by a stranger. Domestic abuse, rape, sexual abuse, criminal assaults, terrorism, combat, physical abuse, being taken prisoner, torture and some consequences of apartheid are all examples of stressors of human design (Dutton, 1992; Janoff-Bulman, 1995; Herman, 1995; Scrignar, 1988; Silove & Schweitzer, 1993). Man-made violence in many cases is referred to as more potent in triggering emotional adjustment problems (de Girolamo, 1992; Pynoos & Nader, 1989; Ullman, 1995; Ullman & Siegel, 1994; WHO, 1992b) and cause more severe and longer lasting PTSD (APA, 1994).

An "act of God", for example tornadoes, earthquakes, hurricanes, volcanic eruptions, floods, can cause PTSD. However, not all people who are involved in disasters develop PTSD and the stressor criterion of DSM-IV should be strictly adhered to (Scrignar, 1988; WHO, 1992b). Commonly recorded major disasters which have occurred worldwide (excluding the United States) since 1900 include floods (339 million people affected), earthquakes (26 million people affected), with similar numbers affected by typhoons, cyclones and hurricanes (3.5 million people affected). Floods were the most frequent and windstorms the next most frequent disaster, while earthquakes caused the greatest number of deaths and monetary loss (WHO, 1992b). Well-known natural disasters in South Africa are the Laingsburg flood disaster in 1981, the 1988 flood disaster in the Free State and Northern Cape (Beyers, 1989), chronic flooding in Ladysmith in Natal and the Riebeeckstad Tornado disaster near Welkom.

Accidents are also referred to as man-made disasters caused by human failure (Baum, 1987; WHO, 1992b). Accidental traumatic incidents include vehicular accidents and workplace accidents. Factories, construction sites, or any place where equipment may malfunction through negligence or eventuality, represent

potential sources of trauma which may impact upon workers (Scrignar, 1988; Smith & North, 1993; WHO, 1992b).

A clear distinction between what is accidental and what is natural trauma is sometimes impossible, because of the increasing effects of man's actions on the overall ecological balance or other human contributions (Smith & North, 1993; WHO, 1992b). For instance, the collapse of a large building, explosions or malfunction of a nuclear power plant, the sudden sinking of a ship, may have elements of a man-made accident due to negligence but could have been triggered by natural elements, for example an earthquake (Scrignar, 1988; Smith & North, 1993; WHO, 1992b). The Coconut Grove night club fire in Boston and the Buffalo Creek Flood in West Virginia (Baum, 1987), the Westdene School Bus disaster (1981), the Helderberg Boeing disaster (1987; Beyers, 1989) are all examples of man-made disasters due to human failure.

Underground mine trauma, especially earth-falls, is also brought about by man-made accidents (Baum, 1987). It is also sometimes difficult to draw a clear-cut distinction between of the role of nature and human error in mine accidents. These earth-fall accidents may be due purely to poor adherence to safety procedures. However, earth tremors may also trigger earth-falls, more so when safety standards are not adequate. The recent earth-fall disaster at the Hartbeesfontein gold mine in which 18 mineworkers were killed and more than 30 injured, were triggered by an earth tremor which measured 3.7 on the Richter Scale (Volksblad, 24 July 1997).

One of the results of workplace trauma is the fact that a traumatized employee may have developed phobic anxiety in the workplace due to PTSD. In many cases these employees have no other skills with which to effect occupational and work environment change. Such employees may thus have to continue working in similar

circumstances, being constantly reminded of the traumatic incident. Consequently, anxiety may increase due to continuous retraumatization (Scrignar, 1988), a tendency which was also found in a group of treatment-seeking miners (Stevens, Calitz, & Gagiano, 1996). With no escape such individuals may resort to suicide (Scrignar, 1988).

According to Baum (1987), the consequences of accident trauma appear to be more persistent than those of natural disasters.

2.3 Factors that influence trauma severity

Insight into different variables within traumatic events would allow for more precise education around the psychological effects of events. It may also contribute to the process of diagnosis and assessment as to who would be in potential need of psychotherapeutic services. (Green, 1993; Green et al., 1989)

The following variables of trauma that affect the emotional consequences to trauma have been identified:

- events experienced in a group or in isolation (APA, 1995; Barton, 1969);
- injuries, or the extent of the effects of the event (Baum, 1987);
- the intensity of the event (APA, 1995; Baum, 1987);
- the duration, the persistence of the event, and has it repeated episodes (APA, 1995; Barton, 1969; Baum, 1987);
- predictability (Barton, 1969; Baum, 1987);
- type of stressor or identity of cause (APA, 1995);
- meaning of the event or perceptions of control over the event (Baum, 1987);
- the impact on community structures (APA, 1995; Baum, 1987);
- participation in atrocities; and

- rescue work.

These trauma factors are subsequently discussed in terms of their pathogenic role in the onset of PTSD.

2.3.1 Group or isolation

Victims who experience trauma in isolation away from the basic unit (for example, in combat situations) may be more at risk for the development of PTSD. The military unit is a buffer and protector from stress (Shalev & Munitz, 1988). In groups contagion of behaviour may occur which may lead to following directions and increased group cohesion during trauma and disasters (Ursano & Fullerton, 1990). Separation of family members during disasters has been reported to engender acute anxiety about one another's welfare (Baum, 1987).

2.3.2 Injury

The trauma may result in severe, moderate, mild or no physical injury. Trauma impacting upon an individual may produce one of three possible effects: (1) physical injury with no PTSD; (2) PTSD with no physical injury; (3) physical injury and PTSD (Scrignar, 1988).

According to Scrignar (1988), clinicians often mistakenly equate the emotional sequelae of physical injury with the signs and symptoms of PTSD. Incomplete recovery and resultant residual disability may cause pain and suffering, but this in and of itself does not constitute PTSD. PTSD and physical injury produced by the same trauma are independent of one another. In a longitudinal study of motor vehicle accident victims, Green et al. (1993) did not find a direct relationship between the physical outcomes of subjects and PTSD at one month and at 18 months

after the incident. They did, however, find that PTSD contributes to the functional outcome and social adjustment. McFarlane, Achison, Rafalowicz and Papay (1994) also found that the injury severity did not account for psychiatric status in PTSD and non-PTSD groups who had similar levels of exposure to fire trauma and who had similar degrees of injuries.

Ayalon (1983) compared seriously wounded victims of trauma with victims with mild to moderate injuries and victims with no injuries. They found that the seriously wounded victims transferred their aggression and hostility to the present, that is the adjustment to their handicaps. Those with mild injuries had the least adjustment problems. They expected the care of the community and did not have guilt feelings. Those with no injuries experienced more guilt, aggression and anxiety compared to any of the other groups. This phenomenon also confirms the relatively restricted role of injuries in the development of PTSD. It was concluded that survivor guilt was fundamental to the increases in pathology in the uninjured group.

However, a relationship may exist between pain associated with physical injury and PTSD. For example, when a traumatic event has produced physical injury, especially slight injury, complaints of chronic pain are common without the justification of objective physical signs. The persistent pain is a reminder of the traumatic event and thereby activates thoughts about mortality and nearness to death. Severely injured patients may remain organically orientated even after discharge from medical services. These physical symptoms, if cognitively interpreted as pathological, result in the activation of the autonomic nervous system and the production of pathological anxiety and additional somatic symptoms (Scrignar, 1988). In this way cognitive factors play a major role in the development and sustaining of PTSD (Attah Johnson, 1990; Desivilya et al., 1996; Scrignar, 1988; TARRIER, 1995). This may explain the reports by various authors

that being injured increases the risk of developing PTSD (Attah Johnson, 1990; Desivilya et al., 1996; Feinstein & Dolan, 1991; Helzer et al., 1987; Scrignar, 1988; Shalev & Munitz, 1988).

Desivilya et al. (1996) reported on victims of a hostage drama. They found that those not injured had no physical reminders of the incident, and these victims also showed fewer adaptation difficulties in the long run than the injured victims did. Similarly, Stevens, Gagiano and Calitz (1996) found that the majority of treatment-seeking gold mine employees with chronic PTSD had moderate to severe injuries. In the mine employee with PTSD such injuries could serve the function of avoiding a return underground when alternatives such as compensation or alternative work on the surface do not exist.

Hospitalization may affect the prevalence rates of PTSD in injured patients. During treatment or hospitalization for a physical injury resulting from the trauma, patients exude optimism, comply with therapy, and adapt to any disability. After the acute crisis has passed these victims present with a philosophical and grateful period of reflection (Shalev, 1992; Scrignar, 1988). In some cases physical injury may actually defuse and limit the stress response by giving the patient something real on which to focus his or her concern (Modlin, 1983). Psychiatric intervention is then not necessary unless the physical injury is very severe and irreversible. In such cases, for example, dismemberment, loss of sight, the mental disorder is more likely to be a major depression rather than a PTSD (Scrignar, 1988). It is then only after discharge from hospital that PTSD might develop (Tarrier, 1995).

When persons are rendered unconscious as a result of the trauma and develop amnesia, posttraumatic anxiety is much less. A possible explanation is that in the absence of memories of the event retraumatization cannot take place (Baum,

1987; Scrignar, 1988). Unconsciousness, and therefore less exposure to the terror and horror during the Coconut Grove nightclub fire was associated with more positive psychiatric prognosis (Adler, 1943). Advocates of the multiple memory system theory framework claim, however, that PTSD can still occur in those victims who lost consciousness during the event (Layton & Wardi-Zonna, 1995).

2.3.3 Intensity

What has definitely emerged from most studies is a close and consistent association between trauma exposure and the development of PTSD (Lee et al., 1995; Goldberg, True, Eisen, & Henderson, 1990; McFarlane, 1986; 1987; 1990; Reich, 1990; Shalev & Munitz, 1988; Shore et al., 1986). As the intensity of traumatization increases, there may be a qualitative change in symptoms as well as an increase in their quantitative intensity (Everly, 1995b; Foy, 1992; Ramsay, 1990; Rundell et al., 1989; Scrignar, 1988; Solomon, 1993).

Threat to life and limb, injury, exposure to the grotesque, hearing cries of distress and violent/sudden loss of a loved one have been identified as dimensions that influence the severity of a stressor (Fritz & Marks, 1954; Green 1993; Green, Lindy, & Grace, 1985). One disaster alone may have many of these dimensions (Pynoos & Nader, 1989). The results of studies reviewed by Baum (1987) confirm the fact that not directly experiencing an event, thus only witnessing or only learning about the traumatic incident, can cause psychological distress. However, the same studies emphasize that being directly affected by the same trauma increases the risk of psychological morbidity. According to Green (1993) the danger of losing one's life is the strongest predictor of psychological morbidity.

The intensity of the stressor relates to the number of senses traumatized. The more senses affected the higher the risk for symptom development (Scrignar, 1988). In a comparison between an aeroplane crash and a tornado, it was found that the higher rate of PTSD in the plane crash study could be attributed to the greater horror and terror experienced by this group. All the senses, visual, auditory, tactile, and olfactory were sensitized by the plane crash incident (North, Smith, McCool, & Lightcap, 1989).

Furthermore, continual close-range exposure to violent death inevitably forces the awareness of one's diminished chances of escaping unharmed, or the illusion of invulnerability into consciousness (Janoff-Bulman, 1995; Krupnick, 1980; Scott & Stradling, 1992; Solomon, 1993). Stripped of this defence, the sense of safety and security (Janoff-Bulman, 1995; Krupnick, 1980; Solomon, 1993), the victim feels overwhelmed by his sense of powerlessness and helplessness and develops a sense of existential insecurity (Solomon, 1993).

For combat-related PTSD the etiological linkage between trauma exposure and the predictable pattern of psychological distress has been well established (Foy, 1992; Foy, Sipprelle, Ruegger, & Carroll, 1984; Jordan, Schlenger, Hough, Kulka, et al., 1991, Solomon, 1993). A large number of studies have shown battle intensity to be the most consistent predictor of PTSD (Solomon, 1993).

The same tendency, that is that the onset of psychiatric disorders following a dose-response exposure pattern, was found in the Mount St Helen's eruption (Shore et al., 1986) and in the Buffalo Creek Dam flood (Gleser et al. 1981): as the intensity of exposure to the disaster increased, the number of victims who developed PTSD increased progressively (Baum, 1987; Desivilya et al., 1996; Gleser et al., 1981; Shore et al., 1986; Weisaeth & Eitinger, 1993).

2.3.4 Duration

PTSD is a clinical condition induced by either a single massive psychological assault or by recurrent or continued exposure to traumatic situations (Attah Johnson, 1990; Kolb, 1987; Scott & Stradling, 1992).

Duration may refer to the period of time that a person is exposed to a traumatic incident. It may also refer to prolonged repeated trauma that occurs to victims, for example where the victim is in a state of captivity, is unable to flee, and is under control of the perpetrator (Herman, 1995; Scott & Stradling, 1992), or where the soldier is repeatedly exposed to combat (Solomon, 1990; 1993). Ongoing stressor experiences, such as war, incest, and spouse battery, do not lend themselves to easy classification and measurement. It is suggested that ongoing events like war be seen as processes rather than as catastrophic events. The process is ongoing and contains within it a number of discrete events. This conceptualization could also apply to other chronic stressors such as police duty, incest and battery (Green, 1993) and even mining.

Several studies have found an association between the duration of combat exposure and prevalence and persistence of PTSD (de Girolamo, 1992; Foy, 1992; Solomon, 1990; 1993; Solomon, Mikulincer & Jacob, 1987). Solomon (1993) says that when multiple wars are the norm, the question becomes not whether a soldier will sustain PTSD or a combat-stress reaction, but when. Overexposure to casualties and to atrocities may result in an inability of the victim to sustain denial, resulting in an emotional decompensation (Shalev & Munitz, 1988). However, Solomon (1989) found that PTSD rates drop when soldiers are withdrawn from combat and not exposed to continued stress. It was concluded that the time between stressors may have a healing value.

In a revision of literature, Herman (1995) concluded that three broad areas of disturbance characterize the effects that prolong trauma. The first is symptomatic. According to him the symptom picture in survivors of prolonged trauma often appears to be more complex, diffuse and tenacious than in simple PTSD. The second disturbance is characterological of nature. Survivors of prolonged abuse develop characteristic personality changes including deformations of relatedness and identity. The third area involves the survivor's vulnerability to repeated harm, both self-inflicted and at the hands of others.

Chronically traumatized people are hypervigilant, anxious, and agitated, without a recognizable baseline state of calm or comfort (Hilberman, 1980). When the trauma is continuous the anxiety escalates to severe levels and diminishes over time to moderate levels of anxiety, but does not return to pretraumatic levels (Scrignar, 1988).

In addition to the initial traumatic event, survivors of traumatic mining accidents seem to experience the ongoing stress of remaining in a dangerous environment while waiting to be rescued. In the longer term, working in an environment in which an accident has occurred - with the general uncertainty and with the continuing threat of another accident taking place - is likely to increase tension and stress levels (Easton, 1988). In a mining context where the working environment is continually a source of potential danger, the anxiety may remain constantly with them and may become gradually worse. For older men it is very difficult to leave the mine. They are compelled, in many cases by economic need, to return to work. In this way they continually re-expose themselves to the dangers which proved so damaging in the case of an accident (Easton, 1988). According to Leopold and Dillon (1963), it appears that repeated performance of a dangerous occupation dulls the capacity for anticipation - and familiarity apparently breeds in the organism a loss of the capacity to defend itself.

2.3.5 Predictability

The suddenness, unfamiliarity and controllability of the trauma, level of preparedness for it, and the extent of warnings about it, appear to contribute to trauma experience (Baum, 1987; Miller et al., 1993). Warning of a disaster situation appears to moderate its impact. Lack of warning can, for example, increase the impact of the disaster (Fritz & Marks, 1954).

Basoglu, Paker, Paker, Ozmen et al. (1994) found that prior knowledge of and preparedness for torture was one of the factors that appeared to have a protective value against PTSD in survivors of torture. Anisman (1984) found that when laboratory animals are exposed to unpleasant events which are out of their control, they experience profound disturbances in behaviour. Initially there is an alarm response, followed by deficits in learning, reduced exploratory behaviour, abnormal sleep patterns and somatic dysfunction. Both the inability to control and the inability to predict the stressor appear to be critical variables in the development of these behavioural and somatic responses (Anisman, 1984; Baum, 1987; Shalev & Munitz, 1988).

The level of anticipation of a disaster event is a joint function of the nature of the event and the community's preparedness and prediction capabilities. It reflects an interaction between the and situational characteristics (Baum, 1987). The benefits of prior warnings depend on the effectiveness of the warning system, and the preparedness of the community (Fritz & Marks, 1954).

2.3.6 Identity of cause or aggressor

The familiarity of the trauma prepares victims for what to expect, hence unfamiliarity may increase anxiety and a sense of loss of control (Baum, 1987).

In the case of stressors of human design the assailant may be known or may be a stranger. Being the victim of a well-known person (e.g., a date, parent, spouse) the breakdown in the assumption of a benign world is particularly acute and is followed by considerable emotional trauma. The victims of rape or sexual abuse usually have difficulty in establishing a sense of trust in subsequent close relationships (Herman, 1995; Janoff-Bulman, 1995). In the case of being victimized by a stranger, the victim often suffers a loss of trust as well. The experience forces a direct confrontation with the realization that people can be malevolent and the world of people becomes suspect (Fischer, 1984; Janoff-Bulman, 1995).

In the case of mine-related accidents a combination of familiarity and unfamiliarity exists. Most miners know the consequences of certain accidents for example, rock-falls. However, they never know when this will occur.

2.3.7 Meaning and interpretation of the event

An individual's idiosyncratic perception and appraisal of potentially traumatic events exert far more influence upon the pathogenic process than does the mere exposure alone. Similar situations can be very stressful for one person and much less so for another according to the way they are perceived and analyzed (Feinstein, 1993; Scrignar, 1988; Shalev & Munitz, 1988; Solomon, 1993; Wilson, 1989). The death of somebody known to the survivor and the age of the deceased are factors that influence perceptions of the event (Solomon, 1993).

The trauma must be perceived and interpreted as dangerous to self or others and be followed by stimulation of the autonomic nervous system. Differences in perception leading to an obsessive preoccupation with the trauma sets apart a pathologic process from a "normal" one. In some cases, for example, when the trauma was intense and prolonged, perception and preoccupation are pronounced, and PTSD may develop in almost anyone regardless of predisposition (Scrignar, 1988; Shalev & Munitz, 1988). Green and associates (1993) found that the risk of PTSD in survivors of motor vehicle accidents were not predicted by the severity of injuries or the nature of the incident but only by the perceived threat to their lives.

The quality of appraisal depends on the integrity of the person's cognitive function (that is, the capacity to think clearly, concentrate, shift attention, scan possible alternatives, and plan in advance). These cognitive functions are largely dependent on the person's state of arousal which, itself, depends on the existing physiological and psychological distress. The result is the vicious circle of stress, high arousal state, diminished cognitive resources and distorted evaluation of the situation. The end result can be a state in which even minor events related to the traumatic incident are appraised as conveying imminent and inescapable threat. If such a condition (that is if the person is left in a state of extreme fear and arousal) lasts for a long time a traumatic reappraisal occurs, in which the entire capability of the individual is discredited. This is the beginning of PTSD. This reappraisal process may take from a few hours to several weeks (Shalev & Munitz, 1988).

The person who had a breakdown during the event may experience it as a terrible blow to his self-esteem, masculine pride, and as a failure to live up to both his own and others' expectations. The result may be an inability to hold good

thoughts about himself (Solomon, 1993). This may be one reason why subjects who had a breakdown during the event experience PTSD more severely than those who did not have such a reaction (Solomon, 1993).

The perception of what has precipitated the event can cause a difference in emotional adjustment patterns. Natural disasters occur because of something entirely beyond the control of victims, while in the case of human-induced acts of violence it can often be perceived as victim precipitated. This belief can then result in guilt feelings which may trigger further PTSD symptoms (de Girolamo, 1992).

Traumatic stressors appear to trigger certain cognitive mechanisms such as thinking by similarity. Through this process, a deadbody is seen as like oneself, and, therefore, familiar. It is thus a process of identification. New and unfamiliar information is discarded during trauma due to the victim's search for something familiar that could provide some feelings of security. Those individuals most subject to identification may be at most risk of developing mental illness following exposure (Ursano & Fullerton, 1990).

An attribution of meaning to a traumatic event provides the victim with an ability to organize the environment, to assimilate the victim's experience and to provide action possibilities. In the absence of "meaning" the individual attempts to develop a meaning for the events that are occurring (Ursano & Fullerton, 1990).

2.3.8 Impact on community structures

Disasters disrupt community cohesion and function. The impact disasters have on a community infrastructure may affect the availability of support systems

afterwards. (Baum, 1987; Erikson, 1976; WHO, 1992b). Furthermore, disasters may be central or peripheral with respect to a community. Geographical peripheral disasters happen to a group of people that have come together by chance (for example, an aeroplane crash). The survivors return to their respective geographic communities where the physical setting and social support networks are still intact. These types of disasters may also be transnational or international in their effects and impact.

A central type of disaster would be one in which the physical and organizational structure of the community is changed (for example, earthquake, floods), because homes are destroyed, people are relocated in different surroundings with strangers (WHO, 1992b). The Buffalo Creek flood in West Virginia in 1972 left thousands of victims homeless after taking 172 lives. This flood was a communal disaster that uprooted the survivors from their homes, took them away from their neighbours, and destroyed the social tissue that gave direction and purpose to their actions and served as a source of nurturing (Erikson, 1976).

One of the serious problems in disasters is the coordination of various organizations and relief efforts. An ambiguity regarding who has legitimate authority seems to contribute to an absence of a "body" (for example, organizations) taking responsibility to coordinate rescue and relief efforts. This initial lack of coordination after a disaster promotes the emergence of isolated islands of activity by local groups who assume responsibility for those functions not met by formal organizations (Baum, 1987; Stevens, van der Linde, Beukes, Grove, 1995).

The ability of rescue operations seems to influence the mood of local residents and other people who are indirectly affected by the trauma. Weil and Dunsworth

(1958) found that the response of local residents ranged from initial panic, grief, and anxiety to hope and euphoria when some trapped miners of a coal mine disaster in Spring Hill, Nova Scotia, made their way to safety. Their responses later changed to stress, grief and fatigue as the rescue attempt was finally abandoned.

2.3.9 Participation in atrocities

The potentially confounded relationship between combat and PTSD comes from studies which revealed that participation in atrocities increased the risk of psychological and behavioural disturbance (McFarlane, 1990). The involvement in atrocities has been found to account for 29% of the variance of PTSD while other combat stressors accounted for only a further 6% of the variance. It was concluded that participation in atrocities conferred a uniquely strong risk of PTSD (Breslau & Davis, 1987a). The reasons for being involved in atrocities is complex, requiring a well-grounded sense of right and wrong, behaviour that involves a choice by the individual which can therefore not be seen as independent of personality (Green, 1993; McFarlane, 1990).

2.3.10 Rescue work

Two categories of rescuers have been identified, viz. the professional and non-professional rescuers. The stress upon the non-professional rescuers may resemble that of the victims, inasmuch as they may be caught up in the impact of the disaster. As volunteers or bystanders in the interim period before professional help arrives, they may suffer the trauma of not being able to achieve success in their rescue attempt (WHO, 1992b). Three sources of extreme stress for helpers of disasters have been identified. These are the fact that rescue workers are exposed to the stress of the event itself, the stress of their role as a help

provider, and the demands of the normal workload which usually continues unabated (Raphael, 1986).

Rescue workers handling dead bodies are traumatized through their senses. The extent and intensity of the sensory properties of the body such as visual, grotesque, smell, and tactile qualities are important aspects of the stressor. Although all sensory modalities are involved in contact with a body, odour may have the highest potential to recreate significant past episodes in a person's life (Ursano & McCarroll, 1990). Rescue workers of a rail disaster for example, reported feelings of helplessness and being overwhelmed by the magnitude and unexpectedness of the calamity, the sight and smell of the dead bodies, the anguish of the relatives, the suffering of the injured, and the extreme pressure of the group (Raphael, 1986). Rescue where it is difficult to reach the victim influences the severity of the experience (McCloy, 1992). One of the main stressors for rescuers is when they become "helpless helpers" due to circumstances (Weisaeth & Eitinger, 1993).

In rescue work risk exists for trauma workers to identify with victims, which may increase the trauma of the disaster experience. Identification may serve to eliminate the unfamiliar and the unknown qualities of the dead into something that is familiar and part of the past (Fullerton et al., 1992; McCloy, 1992; Ursano & McCarroll, 1990). Rescue workers in a mass-casualty air disaster in Sioux City found it especially difficult not to identify with child victims due to the intense feelings of identification of these victims with their own children (Fullerton et al., 1992).

Rescue workers are repeatedly exposed to mutilated bodies, mass destruction, life-threatening situations, and physically demanding situations (Fullerton et al., 1992; Ursano & McCarroll, 1990). Repeated exposure to trauma can put first

response rescue teams, such as fire-fighters and police officers, at an increased risk of developing posttraumatic stress disorders (Fullerton et al., 1992). However, stress is endured better as an active participant rather than as a passive victim (WHO, 1992b).

3. PREDISPOSING FACTORS

A family history of psychiatric disease, a personal history of psychiatric problems, personality factors and a previous history of trauma exposure has been etiologically linked with PTSD. Literature on these predisposing factors is subsequently reviewed.

3.1 Family history

Various family studies suggest that PTSD sufferers have a pattern of psychiatric morbidity in their families (Breslau et al., 1991; Davidson et al., 1991; McFarlane, 1989; 1990). Studies have indicated that genetically predisposed individuals with anxiety need minor stressors to precipitate a stress disorder, while major stressors are needed to produce a breakdown in non-susceptible persons (Cloninger, Martin, Clayton, & Guze, 1981; Cohen, 1970; Robitscher, 1966; Scrignar, 1988).

In a systematic study on this issue, Davidson, Swartz et al. (1985) found that 66% of the PTSD veterans gave a family history of psychiatric disorder; 60% reported drug or alcohol abuse, 22% various types of anxiety, 20% depression, 20% other disorders, 11% unspecified psychosis, and 6% PTSD. Similar results were obtained by McFarlane (1988a) in a study of a community sample of emergency workers, where 55% were found to have a positive family history. According to McFarlane (1990), the incidence of a family history was even higher in the more

chronic cases. In a twin study of Vietnam veterans it was found that 13% to 34% of the variance in PTSD symptoms, and in particular 32% of self-reported startle, was accounted for by genetic factors (True, Rice, Eisen, Heath, et al., 1993). Stevens, Gagiano and Calitz (1996) found that 50% of treatment-seeking mine employees with PTSD had a family history of psychiatric syndromes.

Studies have shown that the PTSD family history was most similar to that of general anxiety rather than to a family history of alcohol or drug dependency or depression (Breslau et al. 1991; Swartz et al., 1985). Swartz et al. (1985) subsequently concluded that PTSD could be an anxiety disorder variant.

It is in the family context that an individual's basic attitudes of life are formed. Where there is a family history of disorder there is more likelihood of a set of maladaptive attitudes being adopted by the offspring. Thus, the findings of family history are consistent with the cognitive-contextual model of distress (Scott & Stradling, 1992).

3.2 Psychiatric history

Various studies have demonstrated a high incidence of comorbidity between PTSD and other psychiatric disorders. The question to be asked is whether they comorbid syndromes were present before the development of PTSD or whether it developed after the PTSD (Engdahl et al., 1991; Friedman, 1990). According to Gagiano (1984) the clinical picture of the primary and secondary condition differs. **Primary** disorders refer to absence of previous psychiatric disorders other than the current disorder, for example, PTSD. **Complicated primary** disorders occur when another psychiatric disorder develops together or after the current disorder. **Secondary** disorders refer to the presence of other psychiatric disorders, or physical disorders or effects of drugs or pharmacological agents

prior to the development of the current disorder. The chronic course of syndromes provides the key to secondary/primary nosology (Munro, 1966).

Next, the role of a history of psychiatric disorders in the etiology of PTSD is discussed, with reference to primary and secondary PTSD.

3.2.1 Primary PTSD

Various studies have indicated the interrelationship between prior history of trauma and PTSD to predispose individuals to develop reactivated PTSD after renewed stressful events (North et al., 1994; Solomon, 1990; 1993; Wolfe, Brown, & Bucsela, 1992). Even in situations where the person appears to have overcome the trauma, heightened vulnerability may ensue (Solomon, 1990).

Solomon (1990) found that acute PTSD was highest in soldiers with prior PTSD episode (66%), lowest among soldiers without prior PTSD (44%), and in between (57%) for soldiers with combat experience. Similar results were found in female Vietnam veterans who participated in Operation Desert Storm. The veterans with high levels of pre-existing PTSD symptoms showed a greater increase across symptom dimensions, which suggests that they were most vulnerable to symptom exacerbation after re-exposure (Wolfe et al., 1992).

Solomon (1989) also indicated that subjects who developed a combat stress reaction during the traumatic situation were more vulnerable to develop PTSD than those without such a breakdown during the trauma. The PTSD symptom intensity in the subjects who had a combat stress reaction were also markedly more intense and longer lasting than those without a breakdown. According to Solomon (1989) these results suggest that breakdown during trauma leaves an imprint that is not easily erased.

Engdahl et al. (1991) stated that when PTSD is the primary diagnosis the co-occurrence of depression and generalized anxiety disorder is an expression of the severity of the PTSD. Stevens, Gagiano and Calitz (1996) found that 87% of treatment-seeking mine employees suffered from complicated primary PTSD, that is they developed major depression secondary to the primary PTSD. None of these patients only had PTSD. It appeared that mine employees with primary PTSD would avoid seeking help and thus only be identified once the PTSD became worse and secondary problems and symptoms had developed. Solomon (1989) also indicated that veterans without a breakdown during the event seldom presented with their PTSD symptoms.

3.2.2 Secondary PTSD

PTSD may develop secondarily to a pre-existing psychiatric disorder and/or personality style. Some studies downplay the role of psychiatric vulnerability and emphasize the primary role of the stressor in the etiology of PTSD. The results of various studies are subsequently discussed.

3.2.2.1 Premorbid psychiatric disorder

Many studies have indicated a significantly increased vulnerability of individuals with a premorbid psychiatric history to develop PTSD (Breslau et al., 1991; Davidson, Swartz et al., 1985; McFarlane, 1986; 1990; North et al., 1989; Sierles et al., 1983). Breslau and associates (1991), for example, reported that subjects with pre-existing anxiety and/or depression had an increased vulnerability to develop PTSD after exposure to trauma. In a well-designed study McFarlane (1989) found that a previous psychiatric history also predisposes victims to the development of chronic PTSD. In a comparison of two disasters, a

plane crash into a hotel lobby and a tornado, North et al. (1989) found a significant greater history of a pre-existing psychiatric disorder to be one reason for the significant higher rate of PTSD in the plane crash study population. North et al. (1994) found that a previous predisaster disorder (excluding PTSD) significantly predicted the development of PTSD in women but not in men.

PTSD secondary to a pre-existing mental disorder was only found in 13% of treatment-seeking mineworkers with PTSD. In fact most of these subjects were well adjusted with no indication of a premorbid personality disorder. It was assumed that mine employees from rural areas constituted a natural selection of resilient, tough and well-adjusted males. The natural leaders of the family, usually the eldest son, would be chosen to take up the responsibility to care for the extended family. This was assumed to explain the reason for the good premorbid adjustment in the group of treatment-seeking mine employees with PTSD (Stevens, Gagiano, & Calitz, 1996).

3.2.2.2 Premorbid personality

The issue of personality traits predisposing toward PTSD is an emotionally charged one due to the stigma attached to mental illness. The predisposition issue is consistently being compared with the etiological role of the stress factor. Arguments differ, some favouring to lend more weight to predisposing factors in the development of PTSD, whereas others provide evidence for the primary role of the stress factor in the PTSD etiology (McFarlane, 1990; Reich, 1990). Two models, the **stress evaporation model** and the **residual stress model** have been fundamental to this etiological quest. The stress evaporation model postulates that stress reactions disappear quickly, unless the individual is pathological. The role of the stressor is therefore not important. In the

residual stress model hypothesis it is postulated that the development of PTSD is dependent on the degree of stress experienced (Foy, Carroll, & Donahoe, 1987). Studies that emphasize personality to predispose PTSD, then studies that emphasize the stressor as primary in the etiology of PTSD and finally, studies that investigated the distinct roles of the stressor and personality in acute and chronic PTSD, are subsequently discussed.

Firstly, the studies that emphasize personality to predispose PTSD, the severity of the symptoms, and the chronicity of the syndrome (Brill and Beebe; cited in McFarlane, 1990, p.12; Hockings, 1970; Horowitz, Wilner, Kaltreider, & Alvarez, 1980; McFarlane, 1987; 1988b). Based on an excellent review of literature on personality and PTSD, Reich (1990) concluded that the evidence for personality to predispose toward PTSD is fragmentary, but definitely inclines to the positive side. People with anxiety-related personality traits, especially those suffering from an anxiety disorder, would be more vulnerable to develop PTSD (Breslau et al., 1991; Scignar, 1988).

The predisposing role of personality factors such as perceptions, coping styles and attitudes have been emphasized. An active coping style, that is a direct confrontation of the stress, has been suggested to predict levels of psychopathology. Basoglu et al. (1994) found that a strong commitment to a cause seemed to have a protective value against the development of PTSD in Turkish political activists who had been tortured. Gleser et al. (1981) found that whether victims of the Buffalo Creek Flood were able to give personal help to others or not and were able to clean and repair their homes or not, were the best predictors of level of psychopathology. However, avoidance as a personality trait was found to be related to the development of chronic PTSD in a group of fire-fighters (McFarlane, 1989). Disengagement coping strategy, that is, wishful thinking, social withdrawal, problem avoidance and self criticism, were the

strongest predictors of current PTSD in battered women (Kemp, Green, Hovanitz, & Rawlings, 1995). Green et al. (1993) found that survivors of motor vehicle accidents who developed PTSD tended to use more neurotic defences compared to survivors who did not develop PTSD.

Secondly, there are those studies that emphasize the intensity of the stressor above personality factors in the etiology of PTSD (Brayshaw, 1991; Friedman, 1981; Speed, Engdahl, Schwartz, & Eberly, 1989; Straker & Moosa, 1988; Weisaeth & Eitinger, 1993). In a well-designed retrospective study by Foy and colleagues (1984) about Vietnam veterans seeking help, they found that poor military adjustment and combat exposure predicted both PTSD and post military adjustment, whereas pre-military adjustment predicted neither. Results of a study by Weisaeth & Eitinger (1993) on an industrial disaster in Norway also indicated that vulnerability factors strongly correlated with the development of PTSD, but the researchers concluded that the most important of all was the intensity of the stressor. They concluded that the actual trauma was a necessary and pathogenic cause of PTSD manifestation. Straker and Moosa (1988) also reported that the intensity of traumatic experiences played a primary role in the development of PTSD in traumatized township residents in a South African township. Brayshaw (1991) found that Zulu subjects with PTSD had a better premorbid history and were functioning better than subjects who were also exposed to unrest but who did not suffer from PTSD.

Thirdly, there are the findings of studies that differentiate between the role of psychiatric predisposition in acute and chronic PTSD (McFarlane, 1988a; 1988b; Shalev & Munitz, 1988; Solomon, 1993; Weisaeth, 1989a). These studies have indicated the impact of the traumatic event to be the most important etiological factor in psychological breakdown and development of acute PTSD. The same studies have also shown that the long-term prognosis and development of chronic PTSD

depends more on pre-accident psychological functioning than intensity of exposure (McFarlane, 1988a; 1988b; Shalev & Munitz, 1988; Solomon, 1993; Weisaeth, 1989a).

A prospective study by McFarlane of a fire disaster (1986; 1987; 1988a; 1988b; 1988c) on the development of PTSD needs special mention. Exposure to disaster was found to be necessary to trigger PTSD but not sufficient to explain and to predict its onset (McFarlane, 1986; 1988a; 1988b). McFarlane (1987; 1988a; 1988b) therefore agreed that traumatic events contribute to the morbidity of PTSD. Similarly, none of the other etiological variables (for example, family psychiatric history, meaning of the event, personality style, previous life experience) identified to be important, were either necessary or sufficient to explain the onset of PTSD (McFarlane, 1988b). Important however, was the fact that introversion and neurotic personality traits in the group with chronic persistent PTSD were significantly higher than in those groups where there was no PTSD or where symptoms had resolved (McFarlane, 1987; 1988a; 1988b). Furthermore, personal meaning of the event as a central determinant of the onset of symptoms was particularly apparent in the patients seen after a fire disaster (McFarlane, 1986). The longer the symptoms of PTSD remained the greater was the role played by vulnerability factors, such as concurrent psychiatric disorder, a positive family history of psychiatric disorder, avoidance as a personality trait, as well as being older and having panicked more during the disaster (McFarlane, 1987; 1988b).

McFarlane (1987; 1988b) concluded that vulnerability was a more important factor in breakdown and predictor of the course of morbidity than degree of stress experienced. Although the role of vulnerability factors was higher than the role of the impact of the stressor in chronic PTSD, it was suggested that vulnerability factors play a significant smaller role on the onset and

maintenance of posttraumatic morbidity than in other types of psychiatric disorders (McFarlane, 1993).

The study of Solomon (1993) had similar results. According to Solomon results suggest that combat stress reaction (CSR) casualties who go on to develop PTSD have an extreme need to perform well, to succeed in competitive situations and a tendency to assume responsibility early in life. The findings show that many CSR casualties are soldiers who stood out for their bravery, dedication and sense of responsibility. These types of personalities have an inability to face feelings of helplessness or lack of control resulting in a objectively slight injury or accident being experienced as traumatic. For men like these, the sense of helplessness and loss of control involved in a CSR were more devastating than for less demanding personalities, who were ready to accept their weakness and the weakness of human condition (Solomon, 1993). Although the findings of Solomon (1993) emphasize the important role of the trauma, the duration and intensity thereof in the pathogenesis of acute PTSD, it was found that predisposed individuals are more prone to develop chronic PTSD. The possibility of personality vulnerability therefore should not be ruled out (Shalev & Munitz, 1988; Solomon, 1993).

Evident from most of these studies is that a complex relationship between exposure, meaning of the event, the person's previous life experience, personality style, family psychiatric history and the development of PTSD may exist (Green et al., 1993; McFarlane, 1988b; Ursano, 1987).

3.2.2.3 The personality of the mineworker

Lucas (1969) discussed personality aspects related to mineworkers based on research of miners involved in an underground mine disaster. White (1982), in his

study on the effects of job stress in the South African gold mining industry, seemed to have associated himself with the description provided by Lucas (1969).

Lucas (1969) emphasized mining as a "masculine" occupation and said that the miner represents the quintessence of masculinity. Therefore overt expression of anxiety or fear is not permitted. Lucas was of the opinion that miners believe they are "real" men, harder and tougher than other men. The miner's toughness and fortitude rule out public admission of fear or discussion of danger, and as in combat, every effort is expended to control anxiety. By maintaining his outward unconcern, the miner compels others to act towards him as though he is unconcerned. The miner convinces himself that he is not anxious and others treat him as though he is not anxious, and so he is able to maintain his male image.

Lucas (1969) compared the underground miner to the paratrooper, who faces the most dangerous situations of all soldiers in combat, and who is not permitted to express his anxiety and fear freely, but must always have a rough, tough and ready demeanour. According to Lucas this suppression of emotional behaviour is not a casual nicety, but is the very fibre of the miner's self-concept because a code as universal as "being a man" is likely to be deeply internalized.

Lucas (1969) went on to say that miners solve the problem of anxiety by concentrating on the work at hand and the money earned, and by filling in time with approved social banter. Mining poses a fresh challenge to each miner to prove himself a man, and having proved himself, the miner finds it difficult to break away from the miner's subculture into a less dangerous occupation. According to Lucas it seems likely that miners find the dangers and hardships of their job exhilarating and that the continual proving of their toughness and manliness is a source of satisfaction and self-esteem. According to White (1982)

the white miner in South Africa is probably very similar to his American counterpart as reported by Lucas (1969).

According to van der Vliet (1974), almost all the blacks working in the industry have undergone a process of initiation into manhood. The major feature of the initiation process is that it teaches the initiate to endure discomfort and privations stoically, a feature that distinguishes the "man" from the "boy". The initiate might therefore be subjected to beatings, unsavoury food, a prohibition on the drinking of water, sleep deprivation, and bathing for long periods in icy rivers. White (1982) stated that the Black worker probably regards working on the mines as an extension of his initiation, or as a test of his manhood, just as the white miner does.

According to Lucas (1969), it is possible that there is an element of self-selection into mining jobs, as mining has an image of being a tough job for tough men. Those who apply to enter the industry probably at least regard themselves as meeting the criteria of "toughness". White (1982) indicated that the dropout rate in the training colleges of the mines is very high, especially in the first month of training. This is attributed to people realizing quickly that they have made the wrong choice, or to the instructors recognizing and weeding out those who are unsuitable very early in the training process.

In a study of treatment-seeking gold mine employees with PTSD Stevens, Gagiano and Calitz (1996) found them to be premorbidly well-adjusted. None of these subjects suffered from a personality disorder. Two reasons, which also entail a form of selection, were proposed for this result. Firstly, it is assumed that a natural process of selection occurs in the mine industry, the so-called "healthy worker effect". That is, employees who cannot adjust leave the mines without presenting with their problems for help. This process therefore keeps the mines

free from older subjects who may still have suffered from chronic PTSD. Only the less vulnerable and more resilient workers therefore remain.

Another reason that could explain the good premorbid functioning of these subjects is that they represent a selected population from the rural areas that are given the responsibility of supporting the extended family. These individuals would probably be the eldest male children of a family since traditionally they take over the responsibility of caring for the extended family from the father. Some eldest male children may therefore be prepared for their tasks as head of the extended family (Stevens, Gagiano & Calitz, 1996).

3.3 Trauma History

Persons who have been emotionally traumatized early in life may be at risk for breakdown, depending on the intensity and duration of the early life-threatening experience (Astin, Ogland-Hand, Coleman, & Foy, 1995; Breslau et al., 1991; Davidson et al., 1991; Kolb, 1987). Even though histories of severe trauma are found in many psychiatric patients they do not all have PTSD. In such cases their traumas may have become integrated into the totality of their personality organization. However, there is clear evidence that prior trauma predisposes adults to develop full-blown PTSD in response to later life stresses (Astin et al., 1995; Kemp et al., 1995; Solomon, 1988a; 1990; van der Kolk, 1988).

The experience of traumatic events in early development may be especially damaging because they may interfere with achievement of developmental milestones and, therefore, may place individuals who later experience trauma at greater risk for PTSD symptom development (Astin et al., 1995). Multiple traumas may potentiate effects even more than in the case of single traumas, rendering

individuals with a history of more than one trauma more vulnerable to the development of PTSD (Astin et al., 1995, Kemp et al., 1995).

Although research has clearly proved the predisposing role of developmental trauma, different views exist on the role of repeated exposure to stressful events and the development of acute PTSD. These views, the vulnerability perspective, the stress inoculation perspective and the stress resolution perspective are subsequently discussed.

The **vulnerability perspective** implies that repeated exposure to stressful life events is a risk factor. Available coping mechanisms may decrease with each stressful life event, thereby increasing vulnerability to physical and emotional disturbances (Selye, 1976). Where recurrent stressful events happen the prognosis would be poor for acute, chronic or residual PTSD individuals. Sporadic recurrent events tend to reactivate latent memories of traumatic incidents and therefore delay recovery from PTSD (Kardiner, 1941; Solomon, 1990; Sorenson & Golding, 1990; Williams, 1993).

If the person is subject to another traumatic event, he or she re-enters the recovery process at a higher level of physiological and psychological tension. Individuals who have not successfully resolved previous trauma are at risk of "stair-stepping" to more pathological and distressing emotional reactions after a new event (Scrignar, 1988. Williams, 1993). Kolb (1987) indicated that men who developed symptoms in the combat line and were returned to duty, collapsed and ended up with the most severe pathology.

It was found that time away from the stressful environment fostered healing (Solomon, 1989). Withdrawal from exposure, nonrecurrence of exposure, or

avoidance of memory-arousing experiences similar to the initial stressing events is in many patients followed by extinction of these phenomena (Kolb, 1987).

Applied in the mining industry, this theory would predict that every mine accident the mineworker encounters requires the use of a high level of energy for readjustment, and this depletes the worker's energy reserves, depletes his resilience, and renders him more vulnerable for subsequent post traumatic stress. In fact, Stevens, Gagiano and Calitz (1996) found that the majority (88%) of a sample of treatment-seeking mine employees with PTSD were previously involved in more than one traumatic mine incident. White (1982) also found that mine employees working in mines with higher accident risks experienced significantly more stress symptoms and stress related behaviour than mine employees working in mines with significantly lower accident risks.

According to the **stress inoculation perspective**, repeated stress may immunize the person and therefore have a positive effect on health and coping. Repeated stress contributes to the development of useful coping strategies (Epstein, cited in Solomon, 1990, p.117). In mining it means that training in simulated circumstances, and exposure to accidents, leads to sensitization and improved resilience for that kind of trauma. In support White (1982) found that workers habituate to the effects of the job stress because of the daily encounters with it. It appeared that mineworkers developed an elaborate system of defence mechanisms to protect themselves against excessive levels of anxiety, the most important of which is denial (the "it can't happen to me syndrome"). This study, however, only looked at job stress and did not investigate specific traumatic events. The results can thus not be generalized in respect of miners who have a history of previous accidents. According to Basoglu and colleagues (1994), it appeared as if Turkish political activists who had been exposed to repeated

torture became immune to the effects of torture. This immunization appeared to be one of the factors that provided resilience against PTSD (Basoglu et al., 1994).

The **stress resolution perspective** considers the outcome of the earlier stressful experience, and not the mere exposure to stressful events, as the factor that determines the impact that repeated stressful life events will have on subsequent coping and health (Solomon, 1990). Successful resolution of a stressful episode promotes a feeling of well-being and improved coping resources, whereas an unsuccessful outcome leads to increased distress and a decrease in coping resources (Block & Zautra, 1981; Solomon, 1993).

Findings by Solomon (1990; 1993) supported all three perspectives: repeated exposure is a risk; some exposed soldiers, even some who did have previous breakdown, do develop skills and become accustomed to the stress, and, soldiers with positive management of, and successful coping with each event were the least likely to develop PTSD. However, the stress resolution perspective was able to comprehensively explain the results whilst the other two were only able to explain some of the results. On the other hand Solomon, Mikulincer, & Jacob (1987) indicated that, given repeated battery, the bravest and most balanced might all break down by the repeated onslaught of trauma. Solomon (1993) subsequently stated that with the accumulated stress of successive wars, the lessons and positive experience of the past offer less and less protection. The question becomes not whether a soldier will sustain combat stress reaction, but when (Solomon, 1993). Similarly, it may be assumed that mineworkers who continue to work in dangerous circumstances and who are repeatedly exposed to traumatic incidents may eventually develop stress-related symptoms.

Several authors also assessed the distinct etiological role of 1) the intensity of the trauma and 2) the role of previous exposure to trauma on the likelihood of

victims to develop PTSD. The results indicated that even though previous trauma may predict PTSD, it was a weaker predictor than intensity of the current traumatic event (Kemp et al., 1995; Solomon, 1993; Solomon, Mikulincer and Jacob, 1987). Solomon, Mikulincer, & Jacob, (1987) found that in combat, as battle intensity increases the effects of prior experience such as, vulnerability or resilience, become less important. Whether one is vulnerable or not, the risk of developing PTSD becomes the same as intensity of trauma increases. The current stressor then becomes the primary determinant of breakdown. It seems therefore that intensity of the traumatic event overrides vulnerability or resilience. Any person will then be in serious danger of developing a breakdown which in turn will then increase the vulnerability of PTSD onset (Solomon, Mikulincer, & Jacob, 1987).

4. BIOLOGICAL FACTORS

Within the area of stress disorders, abnormal psychophysiological findings can be interpreted either as a result of the exposure to stress or as a precondition to develop a stress disorder after stressful exposure (Shalev & Rogel-Fuchs, 1993). Research suggests that PTSD has a unique biological profile consisting of alterations in sympathetic arousal, the neuroendocrine system and the sleep/dream cycle. This profile distinguishes PTSD from both major depression and panic disorder (Friedman, 1988). In a summary of controlled studies, Vargas & Davidson (1993) indicated that different neurochemical subtypes of PTSD might exist. Neurochemical systems that have been most studied include noradrenergic, dopaminergic, endogenous opiate, gamma-aminobutyric acid (GABA), benzodiazepine, serotonergic, the hypothalamic-pituitary-adrenal (HPA) axis systems and the Gonatropic axis (Everly, 1995b; Lating & Everly, 1995; Southwick et al., 1995; Friedman, 1995; Vargas & Davidson, 1993).

What can be concluded from studies on the above-mentioned systems is that an enhanced sympathetic nervous system activation exists in PTSD and that increased sympathetic arousal may be closely linked to severity of certain PTSD symptom clusters. These mentioned multiple neurobiological systems are being mobilized by the individual under conditions of acute and severe psychological trauma for the purpose of survival. These systems appear to interact functionally with one another as the individual attempts to cope with impending danger (Southwick et al., 1995).

In addition, several brain structures - most notably the hippocampus, amygdala, locus coeruleus and prefrontal cortex - also appear to become activated. These structures are markedly affected by uncontrollable stress, are functionally and neuro-anatomically interrelated and may mediate many of the symptoms of PTSD. The simultaneous alterations of brain neurochemical systems and structures during acute traumatic stress probably represent adaptive responses critical for survival (Southwick et al., 1995).

Endogenous norepinephrine, benzodiazepine, and dopamine appear to mediate fear, autonomic hyperarousal and hypervigilance, each of which facilitates appropriate behavioural reactions to threat. Norepinephrine additionally appears to influence some somatic functions, including heart rate and blood pressure. Trauma-induced cortisol hypersecretion influences the metabolic activation necessary for sustained physical demands and tissue repair during acute stress. Secretion of endogenous opiates reduces pain sensitivity of injured victims of severe trauma. Finally, norepinephrine and opiate systems may facilitate the encoding of traumatic memories that will facilitate appropriate responses to future danger.

Although initially beneficial, neurobiological responses to trauma may have long-term negative consequences that are related to many of the chronic symptoms of PTSD (Southwick et al., 1995).

5. MODULATING FACTORS RELEVANT TO THE MINING INDUSTRY

Biographic factors that may mediate the levels of stress in South African gold mine employees are age, experience, marital status, migration/ethnicity, occupational and residential mobility, language, education, training, group cohesiveness and posttraumatic factors. These factors are subsequently discussed.

5.1 Age/ experience

Several studies have reported differences in reactions among age groups after traumatic events (Desivilya et al. 1996; Handford, Mayes, Mattison, Humphrey et al., 1986; Pynoos & Nader, 1989; Straker & Moosa, 1988; WHO, 1992b). Influenced by their phase of development and prior experience, individuals vary in their attempts to interpret the events and their symptoms, to regulate their emotions, and to search for meaningful information and assistance (Pynoos & Nader, 1989; Straker & Moosa, 1988). Kolb (1997) found that younger persons are more susceptible to the development of PTSD because they have less experience and thus possibly less neuronal activation.

According to Hibler & Duncan (1983), the onset of acute stress reactions after battle tends to occur more frequently in individuals who are young, low ranking, have fewer social supports and have undergone recent lifestyle changes. Various other studies reported that younger adults experienced more PTSD symptoms, and being young may be a higher risk for PTSD (Breslau et al., 1991; Davidson, 1991; Norris, 1992; Ullman, 1995; Ullman & Siegel, 1994). Some explanations for

increased symptoms among young adults include a reporting effect with the young more willing to acknowledge symptoms, a cohort effect or generational difference in symptom acknowledgement, and possible lower resilience among younger persons in respect of the effects of trauma (Norris, 1992). It is also possible that young adults have fewer personal and social resources to buffer the stressful effects of a traumatic event (Ullman, 1995).

White (1982) stated that experience could be one of the most important mediating factors of stress in underground gold mining. According to McGraph (cited in White, 1982, p.66), experience prepares the individual to deal with a stressful situation by providing familiarity with the situation so that he knows what to expect, and secondly, it provides him with training or practice in the appropriate responses. White (1982) indicated that the underground environment would be particularly stressful for the mineworker new to the industry, and especially if he is exposed to the Western technological work ethic for the first time.

Sleight and Cook (1974) reported that miners were particularly vulnerable in their first year in the industry, and that the accident rate was particularly high during the first six months in a new job. These findings suggest that workers new to a job or industry are under greater strain than those with more experience.

Cassel and Tyroler (1961) studied two groups of rural mountain-dwellers. The one group was composed of individuals who were the first in their families to enter industrial employment. The other group comprised individuals in the same factory drawn from the same mountains and doing the same work for the same wages, but were the children of workers previously employed in the factory. As predicted, the individuals from families exposed to industrial work for the first

time developed more health problems and had higher rates of absence due to illness than the "experienced" group. These differences were found to persist for many years.

White (1982) found that experienced employees in the South African gold mines experience less job stress than employees new to the industry. Inexperienced underground workers were much more alienated, much more dissatisfied with their jobs, had much higher levels of job-related tension, were in poorer health and were slightly more anxious than the experienced workers. They also tended to smoke more and stay away from work more often than the experienced workers (White, 1982).

Stevens, Gagiano and Calitz (1996) also found that the majority of treatment-seeking gold mine employees with PTSD were in the young adulthood life stage. Two possible reasons have been put forward for this tendency. Firstly, the lack of experience, cultural shock, and unpreparedness could render younger employees more vulnerable. Secondly it was proposed that a natural process of selection occur in the mine industry, the so-called "healthy worker effect" (Rockette, 1983). Employees who developed PTSD had already left the mine due to the dynamics of PTSD (avoidance behaviour). This process therefore keeps the mines free of older subjects who may still suffer from chronic PTSD. Only the less vulnerable and more resilient workers remain (Stevens, Gagiano, & Calitz, 1996). According to McFarlane (1990), the study of such highly selected occupational groups may lead to atypical results that could minimize the role of vulnerability factors in PTSD.

Although there is no conclusive evidence for an interaction between trauma and developmental stage, posttraumatic stress phenomena may influence a number of characteristics affecting the developmental process, including cognitive

functioning, initiative, personality style, self-esteem, outlook, and impulse control (Pynoos & Nader, 1989).

5.2 Ethicity/ migration

Cultural belief systems, along with traditional family and social role expectations, greatly affect psychosocial adjustment in individuals recovering from severe trauma (Boehnlein, 1987; Solomon, 1990; 1993). Many studies have demonstrated that migration to a radically different social or physical environment has adverse health consequences. Migration introduces a process of acculturation. The process of acculturation results in feelings of insecurity. Patients feel caught up between their old culture and the new (Escobar et al., 1983; Kinzie & Fleck, 1987).

Many posttraumatic symptoms can be exacerbated by factors such as immigration, separation from past traditions, and change in social status. PTSD symptoms not only exist in the context of prior trauma, but also in the context of the ongoing stressors of acculturation (Boehnlein, 1987). Migration has been found to increase the risk of mental disorders, of ulcers, of hypertension, of myocardial infarction, and of sudden cardiac death (White, 1982).

The poor health status of migrant workers has been attributed to their marginal status in society. Their integration into the new society is not always complete in the sense that they have not fully adopted its norms, and therefore they are not completely accepted as members (Cassel, 1970; Kinzie & Fleck, 1987). They have to adapt to a completely different culture. During a period of rapid cultural change, as in the case of these migrant gold mine employees, the individual is likely to experience role strain because social roles are changing. As these roles change the individual may experience marked conflict between his

prescribed role and his concept of himself, or there may be severe contradictions in his prescribed roles as he moves from one role to another. Changes in the social system may also displace certain individuals, and prevent some persons fulfilling their traditional roles (Lazarus, 1966).

The majority of the South African gold mine labour force are black employees from rural areas. The distance between the workplace and the rural home is often between 300 km and 1000 km, making weekly commuting to their families almost impossible. Many migrant workers spend from two-thirds to three-quarters of their married lives away from home resulting in unbalanced sex ratios. This again results in widespread illegitimacy, prostitution, a predominance of single-parent households and high rates of sexually transmitted diseases. A heavy burden is then put on the women. They are forced to bring up the children, run the homes and work the lands on their own (White, 1982).

Few of these workers are housed with their families. They usually stay in unisexual hostels, resembling a military barracks, which are based on the mines. This type of housing was introduced because of its economical advantages in housing and controlling a huge labour force with a high turnover. The regimentation introduced by the hostel system virtually eliminated absenteeism, it ensured that workers got to work in time (through a "wake-up system") and that absolute priority was given to production. According to White (1982), the relative crowding which exists in the hostels is likely to constitute an additional stress for these workers. In a study conducted by Lipton (1980) about what the workers liked about the hostels, more than two-thirds reported "nothing". They described their visits home as a month of happiness.

On completion of their spells of work these mineworkers return to their homes for periods varying in length from one month to six months or more, depending on

their employment contracts. In addition to the stressors of underground work, these migrant workers have to endure the stress of separation from their families for long periods. Most of these migrant workers are illiterate, and the only contact with home while they are on the mines is occasional unreliable information relayed by word of mouth (White, 1982).

White (1982) found that blacks experienced significant higher levels of job stress, higher anxiety levels and that they drank alcohol for escapist reasons more frequently than whites. Black mineworkers were also found to be more alienated than whites. These differences were considered in all cases to be due to the influence of socio-cultural factors and a process of acculturation. For example, black workers were found to stay away from work without permission more frequently than whites, whereas whites took sick leave more often than blacks (White, 1982). This may reflect on the availability of social support networks (blacks are mainly from rural areas and stay in hostels), transport problems when returning from weekends or leave and the availability of quality health care. White (1982) also found significant differences in stress and anxiety levels between different ethnic groups. Sothos and Tswanas experienced significant more anxiety than Xhosas and Zulus. He was not able to explain the reasons for these ethnic differences (White, 1982).

According to Pynoos and Nader (1989), additional studies are needed to assess the relevance of cultural factors among different subpopulations experiencing different types of disasters (Pynoos & Nader, 1989).

5.3 Marital status

According to Solomon, Mikulincer, Freid and Wosner (1987), it is important not to misinterpret marriage as equal to social support. These authors found that

married Israeli soldiers have higher rates of PTSD than unmarried soldiers. Various reasons have been given for these surprising results. Firstly, soldiers have to re-establish contact and negotiate their place, filled by the wife in the interim, when they go home. The returning veteran may for example return home to a power struggle that undermines his ability to reassume his role as head of the household (Solomon, 1993; Solomon, Mikulincer, Freid & Wosner, 1987). Secondly, it may be related to the stressors inherent in married life itself. Thirdly, given the depletion of coping resources of the person returning from war, the afflicted veteran may have considerable difficulties in channeling inner resources to handle any marital demands. In the fourth place, the stressed veteran may use his symptoms to obtain secondary gains and to throw off unwanted responsibilities onto his wife - therefor not adapting and integrating the traumatic experiences. A fifth point is the fact that a married person may have adjusted to a new coping style, one in which he became dependant on his wife. This may leave him with fewer coping abilities (Solomon, Mikulincer, Freid, & Wosner, 1987). The same authors found, however, that family cohesiveness and social support correlated with less PTSD symptomatology.

It is possible that these findings can be generalized to the migrant mine worker, since most of them only go home on weekends or when annual leave is due. O'Connell (1980) in fact indicated that the absence of men in the traditional family was experienced by women as an increased status symbol, as they then take over the responsibility of the house holding.

5.4 Occupational and residential mobility

It has frequently been indicated that change in itself, whether favourable or unfavourable, expected or unexpected, is very stressful (Holmes & Rahe, 1967). White (1982) reviewed various studies which indicated that social or geographic mobility, occupational mobility (whether it be a change of job or promotion), and

residential mobility have been found to be associated with increase in mental disorders, chronic heart disease, tuberculosis, increase in accident rates and mortality rates.

White (1982) says that these findings on the effects of high occupational and residential mobility are significant for the gold mining industry because of the frequent occupational transfers that occur in the industry. The high rate of transfer from job to job and from one work section to another is caused partly by the high labour turnover associated with the migrant and contract labour system; partly by the nature of mining work (for example, sections being worked out, or being closed because they became too unsafe or too difficult or too expensive to mine), and partly by management action (for example, inadequate planning). In addition, the long distances that have to be travelled to visit loved ones over long weekends or leave periods could be very stressful. These exposures may therefore have adverse effects on the health of these individuals.

5.5 Language

The mineworkers represent various different ethnic groups. The most common ethnic groupings in the Free State gold mine region are Southern Sothos, Xhosas, Tswanas, the Afrikaans-speaking group, and the English-speaking group. Swazi, Zulu, and Northern Sotho speakers are also employed, but to a lesser extent. This created serious communication problems in the earlier days of the developing gold mining industry. To deal with this, a language called Fanakalo was invented by the mining industry. This language is largely based on the Nguni languages, but with English and Afrikaans elements. In the underground situation, it is used exclusively as the means of communication, whether it is between Black and White, or between Black and Black.

Fanakalo has a very limited vocabulary. It was developed for the sole purpose of communicating instructions in the work situation, and is totally unsuited for the expression of feelings and emotions. There is considerable inter-ethnic conflict on the mines, and this is a further source of stress for the mineworker, and in particular for Black mineworkers. According to White (1982) it is likely that this conflict can be attributed in part to a lack of understanding caused by language barriers, and by frustrations caused by the inability to communicate feelings.

5.6 Education

Lower education has been significantly associated with PTSD status (Solomon, Mikulincer, Freid et al., 1987; Breslau et al., 1991). Ullman and Siegel (1994) also found that less education was related to higher risk of trauma exposure and therefore an increased risk of developing PTSD.

Most underground miners have a limited education and are from very poor rural areas (Easton, 1988; White, 1982). These employees can thus be more vulnerable to PTSD development on exposure to trauma.

5.7 Group cohesiveness and training

Adequate disaster training and education, the individual's level of preparedness, high motivation, cohesiveness within the group and effective leadership, are viewed as the best predictors of the individual's health status against personal trauma (Hibler & Duncan, 1983; Shalev & Munitz, 1988; Solomon, 1993; Weisaeth, 1989a).

Certain occupations have predictable and repetitive trauma. Some are inherently more likely to evoke guilt related to such responsibilities (Williams, 1993). Some are also associated with physiological conditions, for example lack of food, sleep, water, and exhaustion due to environmental conditions, which may all act together during traumatic situations in influencing the resilience of the individual (Shalev & Munitz, 1988). People involved in such occupations can be prepared and trained to cope with the mentioned aspects (Williams, 1993). Well-trained individuals may become immune to the effects of the trauma and they will then be able to bypass the shock phase (Weisaeth & Eitinger, 1993; Williams, 1993).

Due to their personality traits certain individuals may be drawn to high-risk occupations that are unsafe, dangerous, or "action orientated". The nature of their work as well as their personality make-up often lead to a special cohesion between these employees. This means that they often draw their emotional support from co-workers and they may begin to develop an "us/them" attitude toward people who are not in their line of work. Frequently a spirit of camaraderie exists within their industry. One consequence of this pattern of affiliation is that major trauma will have systemic effects (Williams, 1993).

The South African gold mining industry is characterized by continuous life threatening circumstances. The underground working environment requires well-trained individuals who are able to function in teams. Teamwork and team cohesion is emphasized in the gold mines. Mineworkers annually receive training to ensure safety standards, undergo an annual medical and most employees from rural areas live in hostels which foster cohesion and unity.

The gold mines realize the positive value team spirit has on production and safety. Regular training, slogans and the identification of leaders with the ability to unify workers is a way of life in South African gold mines.

5.8 Social support

There is agreement that social support and intense kin relationships are highly supportive and facilitate post-disaster recovery among victims (de Girolamo, 1992; Figley, 1995; Scott & Stradling, 1992; Shalev & Munitz, 1988). It seems likely that an individual without support is both more vulnerable to the effects of trauma and more at risk of maintaining the distress (Basoglu et al. 1994; Davidson et al., 1991; Fullerton et al., 1992; Kemp et al., 1995; Scott & Stradling, 1992). Results of a recent study by Shalev (1992) have provided support for etiological models of PTSD that emphasize the role of the recovery processes (for example, secondary stressors that follow the traumatic event and the adequacy of the recovery environment) and de-emphasize the importance of the initial response.

According to Figley (1995), family members may promote recovery in at least four separate and related ways. Firstly, family members are the first to detect the changed pattern of behaviour of the traumatized family member. Secondly, once the posttraumatic stress reactions are noticed, family members are in a position to help and usually confront the victim in unique ways related to communication patterns characteristic of that family. The supporters then urge the traumatized person to review the circumstances of the traumatic event and the various meanings to it. This enables the victim to recall facets of the trauma that are critical in answering the other victims' questions. Finally, the family may then help the victim to work through his or her traumatic memories and conflicts. Families help victims by "reframing" or offering alternative ways of viewing the

highly stressful event and its consequences in a more positive or optimistic light (Figley, 1995).

Solomon (1993) observed the importance of social support and the recovery environment in the health status of individuals in terms of suicides committed by Israeli veterans as compared to those by Vietnam veterans. Though there were some attempts, there are no known completed suicides in Israeli veterans from the Lebanon war whilst as many as 30% of deaths of Vietnam veterans since return from war were suicides. According to Solomon, a few factors could have contributed to the difference. Firstly, Israeli soldiers have a freedom to express their anger because of cultural toleration. Secondly, Israeli veterans - in contrast with their Vietnam counterparts - returned to a highly supportive containing environment and received a warm welcome on their return. The third factor may be the thoroughly institutionalized nature of grief work in Israel. Survivors could express grief and experience the support of a nation. Furthermore the geographical situation allowed soldiers to visit home more frequently than their Vietnam counterparts. Israeli veterans had the opportunity to experience regularly the comfort of their families, whilst the Vietnam veterans became numb and emotionally dead and also used more substances in an effort to cope with the long periods away from home. According to Solomon (1993), this could be one of the reasons to explain the higher rate of delayed onset PTSD found in Vietnam veterans.

According to Scott and Stradling (1992), it is the individual's perception of support that seems to cushion the effects of a stressor. "'Support' is not something that can simply be provided for a client: the client's trauma beliefs may greatly influence whether he/she perceives elements of his/her social network as sources of support" (Scott & Stradling, 1992, p.26). In fact, literature on social support distinguishes between quantitative social support (number of

friends, number of social activities attended) and qualitative social support (perceived closeness, feeling supported; Kemp et al. 1995). According to Fiore, Becker and Coppel (1983) there are five overlapping components of social support namely, cognitive guidance, emotional support, socializing, tangible assistance and self-revelation. Social support can thus be seen to involve a number of components. Kemp and associates (1995) found that qualitative social support was related to lower levels of PTSD in a group of battered women, whereas quantitative support correlated with higher levels of PTSD. Perceived social support had a positive effect on well-being irrespective of the level of stressors present (Kemp et al., 1995).

It is not only the coping responses and support that influence PTSD, because the reverse may also be true. When PTSD becomes established the client is less likely to be problem orientated. He will not be searching for the best coping response or for supportive friends or family, but is likely to sit immobile. Consequently a vicious circle is set up for the disorder: insufficient coping responses, inadequate support and perpetuated or amplified disorder (Scott & Stradling, 1992). Absence of social support may lead to social isolation and social marginality. In terms of social isolation, those people who live alone and are not involved with people or organizations are particularly at risk. Furthermore, being of a low socio-economic status also seems to be an additional risk factor. In this regard it is vital that attention is paid to the needs of mineworkers from rural areas when it comes to remediation after a mining accident (Easton, 1988).

The important role of a social network has been outlined above. Therefore, it is important to note that in the mining context a very important part of this support system, the family, is not available to the majority of underground mineworkers (Easton, 1988). The absence of the family system was also suggested

to be an important predisposing factor in a clinical sample of treatment-seeking mine employees with PTSD (Stevens, Gagiano & Calitz, 1996). On the mines, the friends and co-workers in the hostels often form a type of "surrogate family". For this reason it is important that these people are included in preventative intervention programs (Easton, 1988).

When trauma has occurred in the workplace, simply returning to that location may cause the person to experience intensification of symptoms upon exposure. As a consequence an increase of sick leave, the quest for job change, irritability and dissatisfaction at work may be observed (Williams, 1993). Occupational accidents are usually followed by inquiries, a process that allocates blame. This could have a mediating effect for increased stress (Williams, 1993).

Organizations with a high potential for trauma, like the mining industry, need a strong response capability for employee assistance as well as to compensate for the absence of a social support system (Easton, 1988). Extensive pre-employment evaluations to select capable people for a stressful occupation, training in emotional response to trauma for all employees in high-risk occupations is becoming a way of doing business. Organizations have the responsibility to help identify and eliminate stress problems that are predictable within their work environment. In settings where trauma is unavoidable, programs and procedures should be in place to deal with the immediate effects of the trauma (Williams, 1993).

In certain settings (for example, the army, the police force, certain mines, banks) organized programs and medical intervention procedures, known as critical incident stress debriefing (CISD), exist for post trauma care (Mitchell & Everly, 1995). The CISD or the shortened version, namely, post-trauma defusing, is solidly based in the crisis intervention theory and educational intervention theory. They are designed to mitigate the psychological impact of a traumatic

event, prevent the subsequent development of a post-traumatic syndrome, accelerate homeostatic mechanisms toward full recovery, and serve as an early identification mechanism for individuals who will require professional mental health follow-up subsequent to a traumatic event (Mitchell & Everly, 1995). According to Hibler and Duncan (1983), the debriefing team should recognize and accept the presence of normal psychological and somatic reactions to battle stress. Most people can tolerate these symptoms if they understand and expect them, and they do not need additional intervention or support. Psychiatric diagnoses should be avoided wherever possible and for as long as possible, since most casualties experience only brief reactions that are exaggerations of normal responses. Diagnosis may damage the casualties' prognoses. Diagnosing and labeling individuals may decrease their perceived control and intensify their symptomatology (Hibler & Duncan, 1983).

6. PROGNOSIS

Recovery begins when survivors realize that the trauma is part of their lives and when they then continue with their stream of adjustment. The survivors have to realize that a return to normality for them would be a different sense of normal than the pre-trauma normal (Williams, 1993). Lack of opportunity to come to terms with the experience by reliving the traumatic event allows the trauma to become fixated (Gersons & Carlier, 1992).

According to the World Health Organization (1992b), a person without marked pre-morbid vulnerabilities may experience the symptoms of a posttraumatic stress reaction but should be expected gradually to overcome and finally to recover completely from these symptoms, provided that the conditions are made favourable for rehabilitation, that qualified treatment is offered when needed and that the person is motivated to tackle his problems. The majority of survivors who develop

long-standing PTSD have been found to suffer from some kind of pre-morbid vulnerability. However, recovery can be expected in the majority of cases (APA, 1994; de Girolamo, 1992; Ursano, 1987; Vargas & Davidson, 1993; WHO, 1992b). Some can even use the trauma of war to move toward health (Ursano; 1987).

In a small proportion of subjects the condition may show a chronic course over many years (de Girolamo, 1992; Scott & Stradling, 1992) and a transition to an enduring personality change (de Girolamo, 1992). McFarlane (1988b) reported that the majority of victims of a fire disaster who were still traumatic at 4 months went on to develop a chronic disorder. The absence of any decrease in the prevalence of the disorder between 4 and 29 months emphasizes, according to McFarlane (1988b), the chronic nature of posttraumatic morbidity. Most studies indicate that symptoms of chronic PTSD cases decrease over time. However, literature is unclear on the persistence of pathology through the second decade (Grace et al., 1993).

In single episode, or briefly traumatized PTSD victims, short-term psychotherapy may be enough (Kinzie & Leung, 1989). Most studies suggest that an adjustment to the effects of the trauma occurs 6 months to one year after the trauma. These studies indicate an incidence of a higher than 30% morbidity during the acute phase which seems to decrease in the majority of studies to less than 25% during the chronic phase of PTSD (Baum, 1987; Kulka, et al., 1990; McFarlane, 1988c; Parker, 1977; Vargas & Davidson, 1993).

This literature study indicates the important role of pathogenic factors, such as history of trauma and disease, family history of disease, personality, culture and social support at the onset and prognosis of PTSD. It appears, however, that whether an individual is seriously predisposed or not, and whether he/she receives treatment or not, his/her prognosis decreases the more he/she is exposed

to stressors resembling the initial traumatic event (Kardiner, 1941; Solomon, 1990; Sorenson & Golding, 1990; Williams, 1993).

7. SUMMARY

A definite conclusion about the relative role of the reviewed pathogenic factors of PTSD is not possible. Any interpretation of data needs to take into account the problems of conducting research in this area. It appears that the answer probably falls somewhere between the poles of opinion (McFarlane, 1990). Furthermore, the role and effects of an acute and short-lived stressor have not been adequately compared with the more enduring traumas, such as being in repeated heavy combat or being a concentration camp victim (McFarlane, 1990), and therefore also working in underground mining circumstances.

The management of patients with PTSD requires a delicate balance between acknowledging the central role of the trauma in causing the intrusive thinking and avoidance, and the part played by vulnerability factors in determining the meaning of the trauma and the pattern of disordered mood and arousal (McFarlane, 1990).

The pathogenic profile of the underground mineworker with reference to the reviewed literature study can be summarized as follows: Underground mine accidents fall in the category of stressors due to human failure. Certain occupations, especially those in the mining areas, are most at risk for exposure to severe mine accidents. Earth-fall accidents occur the most frequently. The majority of underground mine employees are from rural areas and for most of the time separated from their family. However, the relative role of exposure to mine accidents, and number of exposures in relation to familial and psychiatric history, is uncertain. The absence of a stable support network together with the

high-risk mining environment may amplify the risk for an underground mine employee to develop a psychiatric syndrome like PTSD.

Since this study was conducted on a population of gold mine employees in South Africa the next chapter is devoted to cross-cultural literature on PTSD.

CHAPTER 6: CROSS-CULTURAL FACTORS

1. INTRODUCTION

The employees in South African gold mines can be categorized as Black or White persons, coming from different ethnical backgrounds. The majority of gold mine employees in South Africa are Black and ethnical proportions differ from area to area. Trauma research in the gold mines should therefore recognize cultural differences with an awareness of current perspectives and findings on trauma in different cultures. This chapter briefly reviews cross-cultural literature on PTSD.

2. VALIDITY OF PTSD

According to Fabrega and Nguyen (1992), psychiatric syndromes are manifested through behaviour, which per definition has a communication and symbolic character. Therefore aspects such as language, culture, social experience as well as the physical functioning of the individual need to be considered when making a psychiatric diagnosis. Cross-cultural research must consider indigenous expressions of disorder, idioms of distress and ethnocultural sensitivities in assessment. Failure to do so can result in false positives and false negatives, as well as misunderstandings regarding the PTSD experience (Marsella, Friedman, & Huland Spain, 1992). The DSM-IV may thus reflect Western and biomedical cultural patterns that may be difficult to implement on individuals from other cultures and social backgrounds. This could lead to biased diagnosis (Fabrega & Nguyen, 1992).

Mollica et al. (1992) stated that from a cross-cultural point of view, the PTSD diagnosis has not yet been established as a valid disease construct in non-

Western cultures. They said that although PTSD may reveal a similar pattern across cultures a central universal core of PTSD remains to be established. However, the possibility of a culture-bound syndrome, if one exists, still needs to be identified. Moore and Boehnlein (1991) emphasized that if they had known how PTSD was presented in the population they had treated it would have benefited their treatment plans and subsequently the patients. After a review of literature on ethnocultural aspects of PTSD, Marsella et al. (1992) on the other hand suggested that PTSD could occur in any ethno-cultural group following exposure to trauma. They argue against the position that PTSD is a culturally bound syndrome that is only expressed amongst traumatized individuals from Western/industrial cultures.

Stevens and Goosen (1995) were alerted by the few PTSD diagnoses made at a mine hospital in Free State. Factors such as the "healthy worker effect", poor recognition and validity of the PTSD diagnosis in this population were considered as possible reasons for this phenomenon. Eliashof and Streltzer (1992) found increased compensation claims due to exposure to acute stressors. According to Hurrell and Colligan (1983), organizations cannot afford to ignore stress in the workplace anymore. Consequently, for a high-risk environment such as the mining industry, clarity on the validity, nature, pathogenesis and prevalence of PTSD is a priority.

3. ISSUES THAT AFFECT ACCURATE DIAGNOSIS

Several issues have been identified which influence the accurate diagnosis of PTSD in cross-cultural settings. Firstly, it is by not asking about a possible history of trauma. Some of the subjects are so used to trauma that they simply do not report them because they cannot link their symptoms to the trauma. Secondly, psychologists or psychiatrists, who work in traumatized settings, may become too

accustomed to reports of trauma causing them to downplay the truly severe experiences.

A third factor is the style of interview. Cross-cultural assessment with Indochinese refugees usually requires an interpersonal interview style which may lead to inadvertently missing important diagnostic information (Cheung, 1993; Kinzie et al., 1990; Ndeti & Muhangi, 1979). Open-ended interviewing methods require that trauma survivors disclose their experiences in their own words using free recall. This method, according to Mollica et al. (1991), appears to limit reporting and produces the greatest emotional distress. Memory is best enhanced by using neutral methods such as check-lists that help "put words around" the trauma events and symptoms while signalling to patients that the clinician is well aware of the type of experiences they might have endured (Mollica et al., 1991). A study on treatment-seeking gold mine employee that made use of both an interpersonal interview style as well as questionnaires, found that the questionnaire method provided detailed information quickly with minimum emotional sequelae. The reactions of these subjects when the questionnaires were conducted were often disbelief that the researcher could so accurately inquire about their "true experiences" (Stevens, Calitz & Gagiano, 1996).

Another problem in making the PTSD diagnosis across cultures is the clinician's bias, especially the tendency to stereotype, for example, to think that death does not matter to Asians (Kinzie, 1993). Then there is the risk of White researchers having a paternalistic attitude towards Black subjects (Schoeman, 1989). In the mining environment this could be a severe problem since Black subjects may automatically respond to the White researcher from a position of subordination. This could create the effect that the responses of subjects could be what they believe is wanted.

Schoeman (1989) also emphasized that Black people may have a resistance towards the White researcher due to the influences of Apartheid. It would then be difficult for the White researcher to develop an understanding of the ways of life, values and norms of the Black subject.

Language is a problem when researchers have to rely on the help of interpreters. When language and cultural factors interfere, the expression and interpretation of symptoms, as well as the evaluation of the mental status of the subject become difficult (Cheetham & Rzakowolski, 1980; Morris, 1978; Schoeman, 1989). According to Buhrman (1980), language can be a hindrance, even with the best interpreter because there are words, phrases and concepts that cannot be accurately translated. Morris (1978) indicated that the effective reporting of symptoms also depends on the ability of the subject to express him or herself, as well as the ability of the interpreter to interpret the subject's reports in correct and equivalent terms.

Finally, it is a fact that patients seldom spontaneously report key PTSD symptoms. Their voiced complaints are usually somatic (Cheung, 1993; Kinzie et al., 1990; Ndetei & Muhangi, 1979). This may then obviously lead to misdiagnosis and poor treatment. Moore and Boehnlein (1991) found that somatic complaints were the only spontaneous presentation of symptoms in South-east Asian refugees. According to Ndetei and Muhangi (1979), African patients present, almost without exception, with somatic complaints.

In the mining environment it is quite possible that all these factors may to a major degree influence research participation and subsequent results. Research should therefore attempt to neutralize these effects.

4. REASONS FOR SOMATIZATION

Various explanations have been put forward in PTSD cross-cultural literature to indicate the reasons for third world country patients' somatizing their problems. Firstly, non-Western patients are usually unsophisticated about Western ways, and they are often unclear in presenting their symptoms and may be suspicious of Western medicine. Symptoms of PTSD and depression may frequently be understood within an animistic and supernatural belief system. The concept of a Western physician being able to ameliorate their symptoms may be foreign to them and they may therefore not present them (Cheung, 1993; Kinzie et al., 1990; Moore & Boehnlein, 1991). It has also been reported that patients may feel that they must give up their system of beliefs if they accept Western psychiatric care (Moore & Boehnlein, 1991).

Secondly, the African perception of illness is holistic and differentiation between somatic and mental diseases is not made. Furthermore, a perception that Western physicians only treat physical illness exists. Therefore these black patients would usually present with somatic complaints due to a perception that other forms of symptom presentation would not be understood by the Western doctor (Cheetam & Rzadkowsky, 1980).

Thirdly, in a cross-cultural setting the evaluation of traumatic events is often difficult to make because the victims may not report these events spontaneously, for example, due to shame, loss of face, and psychic numbing. They will subsequently present with vague somatic complaints (Kinzie et al., 1990).

Another reason is the fact that there is still a strong stigma attached to psychiatric illness, which is associated with the concept of madness. Patients may therefore emphasize the physical complaints of their psychiatric problems and

ignore the psychological manifestations. Tendencies to be reserved in expressing their emotions and to avoid a display of affect have also been found in South-east Asian patients. The traumatized patients may avoid discussing their experiences, not only because of the avoidance phenomenon inherent to PTSD, but also because of the cultural values that discourage excessive expression of emotions (Cheung, 1993). Furthermore, the Western notion of a talking cure is generally alien to many black people in South Africa (Straker & Moosa, 1988) as well as South-east Asian patients (Cheung, 1993).

5. CAUSAL FACTORS FOR TRAUMA EXPOSURE

Hammond-Tooke (1975) identified the difference between the "why" and the more explanatory "how" question as that which differentiates the pre-scientific view from the scientific view regarding causes of illness. According to him, the Black African functions within a personalized model, in which the world is ruled by forces, for example, witchcraft and ancestral spirits, which are perceived to be the causal agents of illness and accidents.

A belief in witchcraft was found to be common in certain sectors of the black population in South Africa. Revenge is often the motive for witchcraft (Cheetham & Cheetham, 1976; Wessels, 1985). Disrupted interpersonal relationships are also often perceived to be a result of bewitchment. Witchcraft usually seems to occur between close relatives where enough opportunity exists for conflicts and disagreement. It is also believed that achieving individuals might attract jealousy that could lead to witchcraft. While the African value system rejects self-centeredness and arrogance, humility is valued. Therefore, understandably, the behaviour of achievement orientated persons could potentially provoke conflict and lead to higher levels of anxiety in them (Schoeman, 1989).

Stevens, Calitz and Gagiano (1996) found that 25% (4) of the sample (N=16) of treatment-seeking mine employees with PTSD thought that they had been bewitched. Two of these subjects believed that their rural neighbours were jealous of their material prosperity and had therefore bewitched them. It appeared as if the acculturation process created feelings of suspicion and rejection in these subjects. Another subject believed that senior women in his community bewitched him because he had married a girl outside the community. He finally believed he had been poisoned because Western medical treatment did not help for his chest pains.

According to Wessels (1985), it can also happen that the spirits of individuals not brought to peace through normal rituals after death can accidentally take possession of another living person. In fact, one of the subjects in the sample of treatment-seeking employees with PTSD said that he had been confronted by a spirit that he thought wanted to possess and kill him. This person was involved in a rescue operation where many colleagues were pinned by rocks due to earth-fall accidents. It took them weeks to complete the rescue operation. The bodies of the victims were already decomposed by the time the rescue teams reached them. The operation was extremely dangerous and the findings were horrific. He interpreted the depersonalization, dizziness and other panic attack symptoms as influences of a spirit. He thought that the spirit wanted to disorientate him and lead him to the old worked-out mining areas that would ultimately lead to his death all to serve the spirit's purposes (Stevens, Calitz & Gagiano, 1996).

Wessels (1985) stated that the disappointment of the ancestors and the negligence of cultural norms could lead to misfortune as the ancestral spirits might then withdraw their protection. Stevens, Calitz and Gagiano (1996) reported that one of the subjects in the sample of treatment-seeking mine employees with PTSD believed that his ancestors had indicated that he should leave the mine. His

financial circumstances at home, however, forced him to continue working at the mine even though it was the third time that he had been involved in a serious mine accident. He believed that his disobedience led to the ancestors withdrawing their protection with resulting illness and accident proneness.

Stevens, Calitz and Gagiano (1996) thought that the experience of culturally related symptoms in mine employees were related to the process of acculturation. They said that those subjects who presented with culturally related fears (for example, bewitchment) seemed to find meaning in culturally related reasoning for the cause of the accident and consequently their symptoms. According to Kinzie & Fleck (1987), patients seem to experience feelings of imprisonment between their old and new cultures and they eventually find respect and security in their own culture. The underlying reasons given by the treatment-seeking PTSD subjects for their cultural symptoms seem to support the assumption that the belief in omens leads to the conviction that traumatic events are predictable and therefore perhaps controllable. Predictability and controllability both reduce feelings of anxiety and helplessness (Straker & Moosa, 1988). "A belief in omens and premonitions may serve a psychologically protective function by boosting feelings of omnipotence and insulating individuals from feelings of helplessness and depression. Further, the location of causality outside of the self, as in bewitchment, may also serve to alleviate feelings of blame and guilt" (Straker & Moosa, 1988, p.391).

6. SUMMARY

According to this brief review of cross-cultural factors related to the study of trauma, it does not seem that the PTSD concept has been universally accepted as valid, even though much research has proven the contrary. Factors affecting the study of trauma, such as emotional blunting of clinicians and researchers,

interview styles, clinician's bias, racial sensitivities due to the effects of Apartheid, language and cultural differences of symptom presentation, seem to contribute to the absence of representative research in South Africa and other third world countries. This review indicates that research in cross-cultural settings such as the South African gold mines, requires adequate knowledge regarding cultural values relevant to the research population.

The next chapter describes the empirical investigation that was carried out in the implementation of this research project.

CHAPTER 7: EMPIRICAL INVESTIGATION

1. INTRODUCTION

The empirical investigation of the study is explained in this chapter. The aim of the study, the method of the study, the research procedures, the selection of subjects, the assessment instruments that were used in the study and the method of information gathering are discussed. Finally, the method of statistically analysing the results is described.

1.1 Aim of the study

The aim of the study was to investigate:

1. The character of the signs and symptoms of PTSD in mine employees in terms of the criteria of the Fourth Edition of the Diagnostic and Statistical Manual of Mental disorders (DSM-IV) for PTSD (APA, 1994); and
2. The pathogenesis of PTSD in the mineworker.

2. RESEARCH METHOD

It was a prospective follow-up study. Employees exposed to traumatic mine accidents were identified and followed up over a period of time (seven months) to determine the development of illness.

3. RESEARCH PROCEDURES

The research process involved several steps. These steps are presented in figure 2.

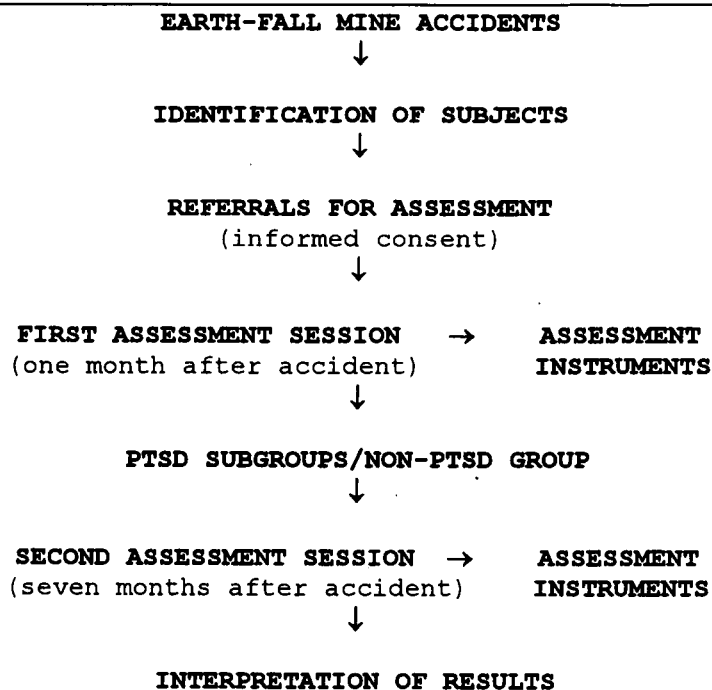


Figure 2 Research procedures.

Employees involved in earth-fall mine accidents were identified and referred for the first assessment one month after the date of the accident. The subjects were assessed after their informed consent to participate in the research project. The subjects with PTSD formed the PTSD subgroups. The subjects not suffering from PTSD formed the non-PTSD group. The subjects were treated when indicated. All the subjects were re-evaluated at the second assessment session seven months after the accident. Assessment results were then statistically analysed and interpreted.

The research procedures will subsequently be discussed in greater detail.

4. IDENTIFICATION OF TRAUMATIZED EMPLOYEES

The subjects were selected from one specific mine of the Free State Consolidated Gold Mines (Freegold). All the employees injured in and/or who witnessed disabling or reportable earth-fall mine accidents were included in the study (disabling and reportable accidents are defined in chapter 2, paragraph 3.1.1).

Officials of the Department of Safety and Health who inspect all mine accidents identified the subjects. These officials listed the names of the employees involved in the earth-fall accidents on an Accident Report Form. This list was sent to the researcher on a monthly basis.

The researcher then scheduled two assessment dates for each subject on an Appointment Form. The first date was one to two months after the date of the accident because PTSD can only be diagnosed one month after a traumatic event. The second date was seven months after the date of the accident because chronic PTSD can only be diagnosed seven months after a traumatic event (APA, 1994). The Appointment Form was then sent to the mine medical station superintendent (professional nurse). A Referral Letter for each subject was attached to the Appointment Form.

The mine medical station superintendent arranged for each subject to be referred to the researcher on the scheduled date. The researcher kept a check-list. Subjects not arriving on scheduled dates for assessment were therefore identified. Alternative dates were then scheduled telephonically with the mine medical station superintendent.

5. INFORMED CONSENT

All the subjects who participated in the research project were supplied with a written explanation of the study and the researcher provided oral clarification thereof. Written consent was obtained from all subjects according to the stipulations of the ethical committees of the University of the Orange Free State and the Ernest Oppenheimer Hospital (EOH).

6. FIRST ASSESSMENT SESSION

The first assessment session was conducted between one and two months after the date of the accident.

The purpose of the first assessment session was to gather baseline information about the symptoms and signs and pathogenic factors of PTSD in the identified and referred subjects. Secondly, diagnostic subgroups were composed from this first assessment session data.

6.1 Assessment instruments at the first assessment session

A separate evaluation battery was developed for each of the two assessment sessions and conducted on each subject. All questionnaires in each of the evaluation batteries were translated into Southern Sotho by the researcher, a social worker and two psychiatric nurses. The final versions were then re-translated blind into English.

The researcher conducted each evaluation battery. The language used was mostly Southern Sotho. The researcher is fluent in Southern Sotho. The majority of Xhosa subjects were able to converse in Southern Sotho. Although the researcher has

limited command of Xhosa, the assistance of an interpreter was used to complete the questionnaires of those subjects who could not speak and understand Sotho. The method of data gathering therefore had a structured interview format based on the questionnaires that constituted the assessment battery.

The following assessment instruments were used during the first assessment session:

1. Biographic Questionnaire.
2. Mine Stress Factor Questionnaire.
3. Holmes and Rahe Stress Scale.
4. Severity of Psycho-social Stressor Scale.
5. Harvard Trauma Questionnaire.
6. Impact of Event Scale.
7. Hamilton Anxiety Rating Scale.
8. Hamilton Depression Rating Scale.
9. Primary and Secondary Nosology Classification Questionnaire.
10. Genetic Classification Questionnaire.
11. Global Assessment of Functioning Scale.
12. AIS-90 Abbreviated Injury Scale.
13. Special Investigations.

The instruments are discussed separately hereunder.

6.1.1 Biographic Questionnaire

6.1.1.1 Aim

The aim of this questionnaire was to determine the profile of subjects in terms of different biographic information.

6.1.1.2 Description

The following biographic data was gathered:

- age;
- gender;
- marital status;
- cultural denomination;
- academic qualification;
- family structure;
- temporary and permanent residence;
- financial responsibility;
- occupation;
- years of employment in the mining industry.

6.1.1.3 Rationale

Biographic data was gathered to determine the relationship of these factors with PTSD symptoms. It was also used to determine biographic trends, for example, age and academic qualification.

Although there is agreement that social support and intense kin relationships are highly supportive and facilitate post-disaster recovery among victims (de Girolamo, 1992; Figley, 1995; Scott & Stradling, 1992; Shalev & Munitz, 1988), little empirical evidence is available in this regard (de Girolamo, 1992; Figley, 1995). Therefore factors in this regard were specifically assessed. Due to the migrant status of many mine employees this factor was assessed in terms of permanent and temporary residence and the presence of the family support system during and after the trauma. Cultural influences were evaluated in terms of their

manifestation through nucleus and extended family structures, sibling status and the consequent financial support role of the subject to either a nucleus or extended family.

Mine-related occupations are categorized in terms of risk level. This factor therefore needs to be taken into account as it could be expected that long-term exposure to certain levels of risk could influence the manifestation of symptoms (de Girolamo, 1992; Foy, 1992; Solomon, 1990; 1993; Solomon, Mikulincer & Jacob, 1987). It was therefore also indicated that years of employment in the mining industry be evaluated.

Various studies reported that younger adults experienced more PTSD symptoms, and being young may be a higher risk for PTSD (Breslau et al., 1991; Davidson, 1991; Norris, 1992; Ullman, 1995; Ullman & Siegel, 1994). The ages of subjects were therefore assessed to determine whether younger subjects were more liable to develop PTSD.

6.1.2 Mine Stress Factor Questionnaire

6.1.2.1 Aim

The aim of this questionnaire was to identify the subjects involved in previous trauma, the nature of the previous trauma, and the nature of the last earth-fall accident that leading to the inclusion of the subjects in the research project.

6.1.2.2 Description

This questionnaire was developed by the researcher, tested during a pilot study (Stevens, Gagiano, & Calitz, 1996) and thereafter improved where indicated. It has two parts. The first part refers to the most recent three previous traumas experienced and/or witnessed and/or learned about by the subject.

The second part refers to the earth-fall accident that led to the inclusion of the subjects in the study. It consists of 23 items that describe the nature of the involvement of the subjects in the accident (for example, experiencing being trapped or witnessing someone being trapped). This questionnaire therefore provided biographic data on the nature of the involvement in the mine accidents. Green (1993) recommended that the measure of the stressor must be made as objective and detailed as possible and questions must be asked about each aspect separately. The Mine Stress Factor Questionnaire provides such detailed information. The subjects were asked whether they witnessed or experienced specific incidents characteristic of an earth-fall accident. The questionnaire reflects the inclusion criteria for traumatic incidents of the DSM-IV (APA, 1994).

6.1.2.3 Rationale

The severity, duration and proximity of an individual's exposure to the traumatic event are the most important factors affecting the likelihood of developing PTSD (APA, 1994).

Due to the suggested predisposing role of previous trauma in the development of PTSD (Kardiner, 1941; Solomon, 1990; Sorenson & Golding, 1990; Williams, 1993), the involvement in previous traumatic events and the nature thereof were

assessed. The nature of involvement in trauma may also affect the subsequent development of PTSD symptoms and was therefore specifically assessed. The questionnaire enabled the researcher to differentiate between traumatic and non-traumatic incidents and consequently to diagnose PTSD or not.

6.1.3 Holmes-Rahe Stress Scale

6.1.3.1 Aim

The aim of this questionnaire was to determine the nature of other stressful life circumstances of the subjects who participated in the study.

6.1.3.2 Description

The Social Readjustment Rating Scale of Holmes and Rahe is an attempt to measure stress factors. Additional stressors that do not appear on the scale may be added at the bottom of the item list (miscellaneous). Numerical ratings should be assigned to the additional items by comparing them with those on the scale. Ratings should be applied to the stressors of the past twenty-four months (Holmes & Rahe, 1967). Ratings were, however, not used in this research because the severity of the stressors was measured on the Severity of Psycho-social Stressor Scale. Only the types of stressors were monitored. The questions require subjects to respond either positively (yes) or negatively (no) to each item.

Thirteen original items and 4 additional items were selected and implemented on all subjects. The additional items asked about the time subjects last went home. For example, whether they had recently returned from leave or whether they still had to go on leave. There were indications in the study of Stevens, Gagiano and Calitz (1996) that subjects recently returning from leave were more liable to

develop PTSD. It was assumed that the additional stress of adjustment to work after returning from leave could have increased the vulnerability of mine employees to develop PTSD. These factors were therefore monitored.

6.1.3.3 Rationale

Stress factors may contribute to, or precipitate the development of mental disorders (APA, 1994). To enable the researcher to monitor the exposure of subjects to such circumstances and the pathogenic role thereof in the development of PTSD, the adjusted Holmes-Rahe Stress Scale was conducted on all subjects.

6.1.4 Severity of Psycho-social Stressor Scale (SPSS)

6.1.4.1 Aim

The aim of this scale was to rate the predominantly acute and predominantly enduring psycho-social stressors in terms of severity.

6.1.4.2 Description

The rating of the severity of the stressor should be based on the clinician's assessment of the stress which an "average" person in similar circumstances and with similar socio-cultural values would experience from the particular psycho-social stressor.

The judgement involves consideration of the following: the amount of change in the person's life caused by the stressor, the degree to which the event is desired and under the person's control, and the number of stressors. The specific psycho-social stressor should be specified as either predominantly acute or

predominantly enduring events (APA, 1987). The severity of events were coded as follows (APA, 1987):

- none: 1
- mild: 2
- moderate: 3
- severe: 4
- extreme: 5
- catastrophic: 6

6.1.4.3 Rationale

The distinction between the predominantly acute and predominantly enduring stressors may be important in formulating a treatment plan. The treatment plan, for example, may be formulated to remove the psycho-social stressor(s) or to help the person to cope with it (them). The information on acute and enduring stressors may also assist in determining the pathogenic role that severity of trauma and stress factors play in the development of PTSD.

6.1.5 Harvard Trauma Questionnaire (HTQ); PART IV

6.1.5.1 Aim

Part IV of the HTQ was implemented with the purpose of diagnosing PTSD according to the DSM-IV PTSD criteria and to identify other associated PTSD symptom manifestations.

6.1.5.2 Description

The HTQ is a self-report check-list consisting of four parts. Parts one to three are related to the cultural setting and stress factor in which the HTQ was developed and cannot be applied without revisions (Mollica et al., 1992). Part IV of the HTQ includes 30 symptom items; the first 16 items were derived from the DSM-III-R criteria for PTSD but also correspond with the DSM-IV PTSD criteria. Item sixteen, however, combined two DSM-IV cluster B symptoms. They are firstly, "intense psychological distress at exposure to cues that symbolize or resemble an aspect of the traumatic event" and, secondly, "physiological reactivity on exposure to cues that symbolize or resemble an aspect of the traumatic event". These two items were separated for diagnostic purposes. Fourteen additional items to describe symptoms associated with traumatic life events were included.

Subjects whose positive responses on the first sixteen items met the DSM-IV criteria for PTSD (APA, 1994) were diagnosed as suffering from PTSD.

The response scale for the 30 symptoms in PART IV is an ordinal scale with four levels - 1: "not at all", 2: "a little bit", 3: "quite a bit", 4: "extremely". A Total Score and Total PTSD Score can then be calculated. An average calculated score greater than 2.5 is considered symptomatic for PTSD (Mollica et al., 1992).

The inter-rater reliability ($r = 0.98$) and the test-retest reliability ($r = 0.92$) is high. The reliability in terms of internal consistency is also high (0.96). The sensitivity of the HTQ for the presence of PTSD is 0.78 and the specificity is 0.65.

Item 18 corresponds with the PTSD criterion relating to impairment of functioning. Six additional items based on results by Stevens, Calitz and

Gagiano, 1996) were included by the researcher to determine acute and chronic PTSD and culturally related trauma responses.

6.1.5.3 Rationale

The value of the HTQ is that PTSD can be diagnosed according to the DSM-IV PTSD criteria. It also has the benefit that associated PTSD symptoms not included in the DSM-IV PTSD criteria can be assessed. This could assist the researcher to determine the nature and distribution of symptoms experienced by mine trauma victims. The severity of symptoms are also rated which, according to Mollica et al. (1992), is especially important in studying highly traumatized populations. It was expected that all respondents would exhibit some level of symptoms.

6.1.6 Impact of Event Scale (IES)

6.1.6.1 Aim

The aim of this questionnaire was to determine the relationship between avoidance and intrusive symptoms in all subjects.

6.1.6.2 Description

The IES measures the impact of traumatic experiences with specific reference to the sub-groups' avoidance and intrusive symptoms. It is a fifteen-item scale with seven items for the intrusion subset and eight items for the avoidance subset in addition to a total stress score. The response scale is an ordinal scale with four levels - 0: "not at all", 1: "rarely", 3: "sometimes", 5: "often". An IES score, an intrusion score and an avoidance score can then be calculated.

It is a reliable, brief and economical instrument for analysing psychological processes (Horowitz, Wilner & Alvarez, 1979; Solomon, 1988a; Solomon, Benbenishty, Neria, Abramowitz, Ginzburg, & Ohry, 1993). The split half reliability of the total scale is high ($r = 0.86$). The internal consistency is also high (intrusion = 0.78; avoidance = 0.82). The test-retest reliability is 0.87 for the total stress scores, 0.87 for the intrusion sub-scale, and 0.79 for the avoidance sub-scale (Horowitz et al., 1979).

6.1.6.3 Rationale

The IES was included in this study to differentiate between the level of intrusion and avoidance symptoms. This will make it possible to determine the level of these different subsets of symptoms during the different phases of PTSD. This could be valuable for improving procedures for diagnosing traumatized employees and improving treatment methods.

6.1.7 Hamilton Anxiety Rating Scale (HARS)

6.1.7.1 Aim

The aim of the HARS was to determine the severity of general anxiety and the relationship between somatic and psychic anxiety in all subjects.

6.1.7.2 Description

The HARS is semi-quantitative and the most popular scale for rating the severity of anxiety. The 14 item scale was specifically designed for use with patients already diagnosed as suffering from neurotic anxiety states. The response scale the HARS is an ordinal scale with five levels - 0: "not present",

1: "mild", 2: "moderate", 3: "severe", 4: "very severe". A thorough description of the different levels for each item is also provided to ensure uniform and consistent assessment of each subject (Hamilton, 1959; Bech, 1993)

The overall score is the indicator of severity. Total scores are interpreted as follows: 0-5, no anxiety; 6-14 minor anxiety; 15 or more, major anxiety (Bech, 1993). Two factors have been identified, namely somatic anxiety and psychic anxiety. Factor scores are determined by dividing the sum of the item scores of each factor for all subjects by the number of items assigned to each factor (Beaumont, 1994). In this study subjects with a total score of more than 15 were diagnosed with a general anxiety disorder.

6.1.7.3 Rationale

The inclusion of the HARS made it possible to determine the level of general anxiety in subjects with PTSD. The specific levels of somatic anxiety and psychic anxiety in PTSD subjects can then also be evaluated. This could be valuable for improving procedures for diagnosing traumatized employees and improving treatment methods.

6.1.8 Hamilton Depression Rating Scale (HDRS)

6.1.8.1 Aim

The purpose of the HDRS was to assess the severity of depression in all the subjects.

6.1.8.2 Description

The HDRS is the most widely used observer rating scale for depression in psychiatry. The scale is basically quantitative. The most widely used version utilizes the first 17 items (Beaumont, 1994; Bech, 1993).

The response scale of the HDRS is an ordinal scale with five levels for items 1, 2, 3, 7, 8, 10 and 15. The levels are 0: "not present", 1: "mild", 2: "moderate", 3: "severe", 4: "very severe". A thorough description of the different levels for each item is also provided to ensure uniform and consistent assessment for every subject. Three levels are allocated to items 4, 5, 6, 9, 11, 12, 13, 14, 16 and 17. The levels are 0, 1 and 2. Each level is also described for every one of these items (Bech, 1993; Hamilton, 1960).

Total scores are interpreted as follows: 0-7, no depression; 8-12, minor depression; 13-15, less than major depression; 16 or more, major depression. It is essentially a means of assessing severity of depression (Beaumont, 1994; Bech, 1993). In this study subjects with a total score of more than 16 were diagnosed with major depressive disorder.

6.1.8.3 Rationale

The presence of symptoms of depression among patients suffering from PTSD has been reported as common (APA, 1994; Moore & Boehnlein, 1991). It was therefore important to measure the severity of depressive symptoms in all subjects. This could be valuable for improving procedures for diagnosing traumatized employees and improving treatment methods.

6.1.9 Primary and Secondary Nosology Classification Questionnaire

6.1.9.1 Aim

The aim of this questionnaire was to identify i) the presence of other syndromes before the development of PTSD (secondary PTSD); ii) to identify the presence of a previous remitted (primary PTSD) or chronic PTSD, and iii) the development of other illness secondary to PTSD (primary complicated PTSD) according to the criteria of the DSM-IV.

6.1.9.2 Description

A primary and secondary classification system for mood disorders was developed by Munro (1966) and later summarized by Gagiano (1984). The researcher adjusted the classification system for mood disorders of Munro (1966) and Wood, Othmer, Reich, Viesselman and Rutt (1977) for application to subjects with PTSD with reference to primary, complicated primary and secondary nosology.

Primary disorders refer to absence of previous psychiatric disorders other than PTSD. Complicated primary disorders occur where another psychiatric disorder develops together or after the PTSD. Secondary disorders refer to the presence of other psychiatric disorders or physical disorders or effects of drugs or pharmacological agents prior to the development of the mood disorder. This information was obtained from the patients themselves and from their medical files. Although the information might not be very reliable it at least provided valuable information with regard to their personal psychiatric history.

6.1.9.3 Rationale

There is a paucity of reliable statistics relating to PTSD and predisposition (Scrignar, 1988). Due to the relatively recent history of PTSD as a diagnosis, classification systems have mainly a phenomenological basis. According to Gagiano (1984) the clinical picture of the primary and secondary condition differs. Therefore an understanding of the nosology of PTSD would be of value if an assumption is made that the primary and secondary classification system also apply for PTSD.

6.1.10 Genetic Classification Questionnaire

6.1.10.1 Aim

The aim of this questionnaire was to determine the presence of i) a family history of other psychiatric illness but not PTSD (spectrum illness), or ii) a family history of only PTSD (familial true illness) or iii) no family history of any psychiatric illness (sporadic illness) according to the criteria of the DSM-IV.

6.1.10.2 Description

Winokur (1972) developed a classification system for primary unipolar mood disorders. He distinguished between depressive spectrum illness, familial-true depressive illness and sporadic depressive illness (Winokur, 1974).

Depressive spectrum illness refers to patients with a family history of alcoholism and/or antisocial behaviour. Patients with familial-true depressive illness only have a family history of depression. Patients with sporadic

depressive illness have no family history of alcoholism, depression or antisocial behaviour (Winokur, 1974). The researcher adjusted the Winokur genetic classification system for PTSD by substituting depression for PTSD. The responses on this questionnaire were a reflection of the knowledge subjects had about their family history. The subjects had the opportunity to verify their knowledge with family members and to report on it during the second assessment sessions. These results were subjective but at least provided some information with regard to family histories of psychiatric illnesses.

6.1.10.3 Rationale

Some researchers have investigated the hereditary predisposition of anxious persons indicating that genetically predisposed persons need minor stressors to precipitate a stress disorder, while major stressors are needed to produce a breakdown in non-susceptible persons (Cohen, 1970; Cloninger et al., 1981; Scignar, 1988; Robitscher, 1966). No genetic classification system has as yet been developed for PTSD. It could therefore be valuable to understand the role of genetic predisposition in the development of PTSD.

6.1.11 Global Assessment of Functioning Scale (GAF)

6.1.11.1 Aim

The aim of GAF was to rate i) the highest level of the overall social, psychological and occupational functioning of subjects during the past year and ii) to rate their overall social, psychological and occupational functioning at the time of evaluation.

6.1.11.2 Description

The GAF Scale is used for rating overall social, psychological and occupational functioning. The GAF scores range from 1 (disabled) to 100 (excellent functioning; APA, 1994). Scores below 70 indicate impairment of functioning (Wittchen, Essau, & Krieg, 1991). The GAF has a relatively high inter-rater reliability; the interclass correlation coefficients of reliability in studies from different populations range from 0.69 to 0.91 (Endicott, Spitzer, & Fleiss, 1976).

6.1.11.3 Rationale

According to criterion F of the DSM-V diagnostic criteria for PTSD the syndrome may only be diagnosed if it causes significant distress or impairment in social, occupational or other important areas of functioning (APA, 1994). The GAF was therefore used to rate the level of impairment so as to facilitate accurate diagnosis.

6.1.12 AIS-90 Abbreviated Injury Scale (AIS-90)

6.1.12.1 Aim

The purpose the AIS-90 was to rate the seriousness of injuries in all the injured subjects.

6.1.12.2 Description

Anatomical severity of injuries was calculated by a surgeon trained as a coder to use the AIS-90 to calculate the Injury Severity Score (ISS). The AIS-90 is a

linear anatomical scale of the severity of injury in each body system, last revised in 1990. The ISS is derived by squaring the AIS-90 counts in the three most severely injured body regions and adding them. The ISS broadly corresponds with probability of survival following injury (Boyd, Tolson & Copes, 1987). An ISS of 1 can be considered a minor injury, 2 - 8 moderate, 9 - 15 severe but not life threatening, 16 - 24 severe and life threatening, and 25 or more critical, survival uncertain. An ISS of 13 - 16 predicts a 10% chance of mortality, whereas an ISS of 75 is considered universally fatal (Boyd, Tolson & Copes, 1987).

6.1.12.3 Rationale

The presence of injuries could increase the risk of PTSD (Shalev, 1992). The relationship between injuries and PTSD was therefore assessed.

6.1.13 Special investigations to screen for alcohol abuse and cannabis abuse

6.1.13.1 Aim

The aim of conducting special investigations was to determine the use of alcohol and cannabis by all subjects.

6.1.13.2 Description

The use of alcohol was firstly assessed by conducting a one-item questionnaire with a four-level response ordinal scale (1: "on occasion", 2: "nearly every day", 3: "daily", 4: "never"). Secondly, a blood specimen measuring the activity of the Gamma Glutamyl Transferase (GGT) enzyme was taken from each subject. Elevated levels of serum GGT activity has been described as useful as a screen

for alcohol abuse (Jacobs, Kasten, Demott, & Wolfsen, 1990). Levels between 0 and 50 were indicated as within normal range.

The use of cannabis was assessed by conducting a one-item questionnaire with a four-level response ordinal scale (1: "on occasion", 2: "nearly every day", 3: "daily", 4: "never"). Secondly, a random urine specimen measuring the level of cannabis use was taken from each subject. This method has been described as one of the best for screening for the presence of cannabinoids and the use thereof (Jacobs et al., 1990).

6.1.13.3 Rationale

Substance abuse disorders have been described to develop secondary to or complicate the clinical picture of PTSD. The use of cannabis and alcohol by subjects was therefore assessed (APA, 1994).

7. TREATMENT

Post trauma defusing (Mitchell & Everly, 1995) was conducted on all referred subjects. This method of intervention was followed to inform subjects about the steps they could take when PTSD symptoms develop or increase. Whilst an acceptable method of preventative intervention (Mitchell & Everly, 1995), this shortened method of Critical Incident Debriefing was also chosen for the limited potential it could have on the course of PTSD symptoms. In fact, McFarlane (1988c) found that the long-term morbidity of a group of people at high risk for PTSD development or with PTSD, who underwent an assessment interview, was comparable with the results of a similar group of non-interviewed subjects.

Subjects who suffered from complicated primary or secondary PTSD were additionally treated with Imipramine, a tricyclic anti-depressant. Subjects suffering from other disorders were treated appropriately. Treatment procedures for each subject were indicated in the questionnaire battery of the second session.

8. SECOND ASSESSMENT SESSION

The second assessment session was conducted on all subjects seven months after the date of the accident. The method of data gathering was similar to that of the first assessment session.

The purpose of the second assessment session was to assess the course of PTSD symptoms and associated symptoms in mine employees over a period of seven months. This could give valuable information about the prognosis of PTSD and prevalence of the syndrome over a period of time. It could also provide facts about pathogenic factors that increase the vulnerability of subjects to chronic PTSD. Such information would be of importance in planning of preventative programs, and for choice of treatment modality based on the predominating symptoms during different stages of the syndrome.

8.1 Assessment instruments at the second assessment session

The following assessment instruments were used for the purpose of this study during the second assessment session:

1. Treatment Questionnaire.
2. Mine Stress Factor Questionnaire.
3. Holmes and Rahe Stress Scale.
4. Severity of Psycho-social Stressor Scale.

5. Harvard Trauma Questionnaire.
6. Impact of Event Scale.
7. Hamilton Anxiety Rating Scale.
8. Hamilton Depression Rating Scale.
9. Primary and Secondary Nosology Classification Questionnaire.
10. Global Assessment of Functioning Scale.
11. AIS-90 Abbreviated Injury Scale.
12. Special Investigations.

The Treatment Questionnaire was the only instrument not conducted during the first assessment session. The other mentioned instruments were also conducted during the first assessment session. These instruments were all repeated due to the fact that the circumstances of any of the subjects could have changed in the months that followed since the first assessment session. The course of the symptoms could also have changed during this period. These changes in circumstances could affect the clinical picture of subjects and therefore had to be monitored. The purpose, description and rationale of these instruments were the same as for the first assessment session and will therefore not be discussed again.

Only the second part of the Mine Stress Factor questionnaire was used during the second assessment session. One question was added to this questionnaire. This question asks whether subjects have been involved in other earth-fall accidents since the first assessment session. If they had been involved in new earth-fall accidents this may have influenced the symptom manifestation seven months after the first assessment session. This variable therefore had to be monitored. The rest of the second part of this questionnaire has no changes (see 6.1.2). The purpose, description and rationale of this part of the Mine Stress Factor

questionnaire were the same as for the first assessment session and will therefore not be discussed again.

The Treatment Questionnaire is subsequently discussed separately.

8.1.1 Treatment Questionnaire

8.1.1.1 Aim

The aim of this questionnaire was to record i) the type of pharmacological and psychological treatment subjects received for any psychiatric syndrome diagnosed during the first session and ii) to record whether subjects had returned to their previous occupation since the date of the accident.

8.1.1.2 Description

It is a five-item questionnaire. The first item facilitated response on the nature of psychological treatment. The second item reflected the type of pharmacological treatment subjects received for psychiatric syndromes. The other items indicated whether subjects were transferred to other areas of employment, or whether subjects did not return to their previous work due to injuries caused by the accident or any other reason, or whether they did return to their previous job.

8.1.1.3 Rationale

Treatment procedures were recorded to differentiate between subjects who received treatment and those who did not. They also differentiated between those who experienced differences in environmental circumstances related to their work

environment. Subjects who received a psychiatric diagnosis were treated. This could have affected their clinical picture and therefor had to be monitored.

Differences in work environment could reduce or increase the level of stress experienced by subjects and consequently affect the development of symptoms. The change in work environment was therefore monitored.

9. COMPOSITION OF THE RESEARCH GROUPS

Two hundred employees were identified from 111 consecutive disabling and reportable earth-fall accidents and referred for inclusion into the study over a period of 12 months (from 1 August 1994 to 31 July 1995). This represented an average of approximately two employees per accident. This included a minimum of one subject and a maximum of 13 subjects per accident.

The sample was divided between subjects with PTSD and without PTSD. Different PTSD subgroups manifested during the diagnostic procedures of the first and second assessment sessions. The positions of the subgroups in the natural course of PTSD are presented in figure 3.

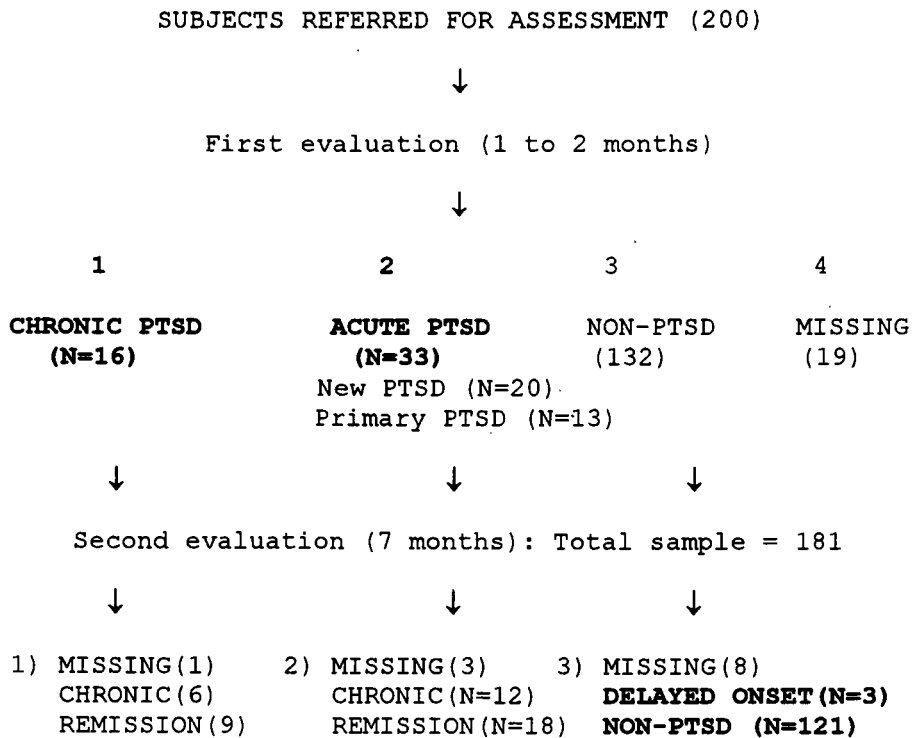


Figure 3 PTSD subgroups.

Four subgroups were identified during the first assessment session. These subgroups and their subsequent diagnostic course during the second assessment session are as follows:

1. The chronic PTSD subgroup (N=16) consisted of subjects who were already suffering from PTSD due to a previous traumatic event. During the second assessment session one (6,25%) subject was missing, six (37,5%) subjects continued to experience chronic PTSD, and the symptoms of nine (56,25%) of the subjects went into remission.
2. The acute PTSD subgroup (N=33) consisted of subjects who developed PTSD due to the identified traumatic event which resulted in their referral for inclusion into the research project. The acute PTSD group consisted of 20 (61%) subjects

who developed PTSD for the first time and 13 (39%) subjects who had a previous history of PTSD (primary PTSD). Subjects who developed PTSD for the first time constituted the new acute PTSD group (N=20). Subjects who had a previous history of PTSD constituted the primary acute PTSD group (N=13). During the second assessment session three (9%) of the subjects were missing, 12 (36,4%) of them developed chronic PTSD, and the symptoms of 18 (54,6%) of the subjects went into remission. The subjects who develop chronic PTSD constituted the acute PTSD chronic group (N=12). The subjects whose PTSD went into remission constituted the acute PTSD in-remission group (N=18).

3. One hundred and thirty-two subjects did not have PTSD during first assessment session. During the second assessment session eight (6%) of the subjects were missing, three (2,3%) of them had developed PTSD with delayed onset, and 121 (91,6%) of the subjects still had not developed PTSD. The subjects with delayed onset PTSD constituted the delayed onset PTSD group (N=3). The subjects who have not yet developed PTSD at both assessment sessions constituted the non-PTSD group (N=121).

4. Nineteen subjects were missing at the first assessment session and could not be included in the research project. This constitutes 9,5% of the total (200) number of employees referred for inclusion in the project. These subjects did not participate in the research project for the following reasons: 1) Seven (3,5%) were killed in the accidents; 2) five (2,5%) could not be found; 3) four (2%) were on leave; and 4) three (1,5%) resigned their work prior to the first assessment period. This group was not followed up and was excluded from the research project.

Eventually 181 subjects were included in the research project sample (N=181).

Four groups were distinguished for interpretation and discussion of results (see

the highlighted groups in figure 3). They are 1) the chronic PTSD group (N=16) which constituted 8,8% of the total sample; 2) the acute PTSD group (N=33) which constituted 18,2% of the total sample; 3) the delayed onset PTSD group (N=3) which constituted 1,7% of the total sample, and 4) the non-PTSD group, subjects who never developed PTSD (N=121), which constituted 66,8% of the sample.

Four groups were distinguished in the acute PTSD group (N=32). That is the new acute PTSD group (N=20), the primary acute PTSD group (N=13), the acute PTSD chronic group (N=12) and the acute PTSD in-remission group (N=18). Their results were also interpreted and discussed.

The pathogenic factors, the signs and symptoms and the course of the symptomatology of the above-mentioned groups are compared and discussed in chapter 8.

10. STATISTICAL ANALYSIS

Frequencies and percentages (for categorical variables) and medians (for numerical variables) were used to summarize the patient characteristics, symptomatology and pathogenic factors. The association between categorical variables were statistically investigated by chi-squared or Fisher's exact tests and numerical variables by the Mann-Whitney test. The 95% confidence intervals (CI) for the difference between two percentages were calculated for categorical data and 95% confidence intervals for the median difference were calculated for numerical data. Within group comparisons were done using McNemars's test and 95% confidence intervals for the difference between two paired percentages for categorical data and Wilcoxon's signed rank test and 95% confidence intervals for the paired median difference for numerical data.

CHAPTER 8: RESULTS AND DISCUSSION

1. INTRODUCTION

In this chapter the results in respect of the pathogenesis and the symptoms and signs of PTSD are presented and discussed as follows:

1.1 Pathogenesis

The results in respect of the pathogenesis of PTSD are presented in terms of *modulating factors*, *stress factors* and *predisposing factors* and discussed as follows:

Modulating factors:

The results in respect of the modulating factors are presented and discussed as obtained from the Biographic Questionnaire.

Stress factors:

The results in respect of the stress factors are presented and discussed as obtained from the:

1. Mine Stress Factor Questionnaire;
2. AIS-90 Abbreviated Injury Scale;
3. Holmes-Rahe Stress Scale;
4. Severity of Psycho-social Stressor Scale; and the
5. Treatment Questionnaire.

Predisposing factors:

The results in respect of the predisposing factors are presented and discussed as obtained from the:

1. Genetic Classification Questionnaire and the
2. Primary and Secondary Nosology Classification Questionnaire.

1.2 Symptoms and signs

The results in respect of the symptoms and signs of PTSD are presented in terms of *DSM-IV PTSD symptoms, comorbid disorders, associated symptoms* and discussed as follows:

DSM-IV PTSD symptoms:

The results in respect of the DSM-IV PTSD symptoms are presented and discussed as obtained from the:

1. Harvard Trauma Questionnaire;
2. Impact of Event Scale; and the
3. General Assessment of Functioning scale.

Comorbid diagnoses:

The results in respect of the comorbid diagnoses are presented and discussed as obtained from the:

1. Hamilton Anxiety Rating Scale;
2. Hamilton Depression Rating Scale; and the
3. Special investigations.

Associated symptoms:

The results in respect of the associated PTSD symptoms are presented and discussed as obtained from the Harvard Trauma Questionnaire.

1.3 Comparisons

The results in respect of the pathogenesis and symptoms and signs of PTSD in mine employees are presented and discussed in terms of the following comparisons:

1. The biographic features of the total research group (N=181) are firstly presented to provide a base of reference.
2. The acute PTSD group (N=33) was compared with the non-PTSD group (N=121) in terms of data obtained at the first assessment session. The primary acute PTSD group (N=13) was compared to the new acute PTSD group (N=20) in terms of data obtained at the first assessment session.
3. The subjects of the acute PTSD group whose symptoms became chronic (acute PTSD chronic group: N=12) were compared to the subjects of the acute PTSD group whose symptoms remitted (acute PTSD in-remission group: N=18) in terms of data obtained during the first and the second assessment sessions.
4. The symptoms and signs of the acute PTSD chronic group (N=12) during the acute phase (first assessment) were compared to the symptoms and signs during the chronic phase (second assessment).
5. The chronic PTSD group (N=16) was compared with the acute PTSD group (N=33) in terms of data received during the first assessment session.
6. Finally the PTSD with delayed onset group is discussed (N=3).

2. BIOGRAPHIC FEATURES OF THE TOTAL RESEARCH GROUP

The biographic features of the research sample were gathered on the Biographic Questionnaire. These biographic features are summarized in table 2.1 and are then discussed.

Table 2.1 Biographic features of the total sample (N=181).

<u>Biographic features</u>	<u>Frequency</u>	<u>Percentage</u>
Median age	39years	
Sotho	121	67%
Xhosa	47	26%
Unisexual hostel accommodation	165	91%
Home in rural areas	174	96%
Married	168	88%
Extended family setup	114	63%
Nucleus family setup	67	37%
First born male child	101	56%
Supporting extended family	130	72%
Education < standard 6	146	81%
Median mining experience	18years	
Occupation: Mining assistant	63	35%
Stope team leader	46	25%
Machine operator	46	25%
Winch driver	18	10%

Table 2.1 indicates that the median **age** of the subjects was 39 years. The majority (46%) were between 34 years and 44 years old. Twenty-eight per cent were younger than 34 years, and 26% were older than 44 years. The mother tongue of 67% of the subjects was **Sotho** whereas the mother tongue of 27% was **Xhosa**. This is a reflection of the geographic population distribution. Most of them (91%) stayed in **unisexual mine hostels** during the period of employment. Ninety-six per cent of the sample's permanent home was in the **rural areas**. Most of the subjects (88%) were **married**. Sixty-three per cent lived in an **extended family** setup, whereas only 37% had a **nucleus family** arrangement.

Table 2.1 indicates that 56% of the sample was **first-born** males. This possibly reflects a tendency of natural selection among family members from rural areas. The eldest son traditionally has the inherited responsibility to care for the whole family. These individuals may therefore naturally take up the responsibility to apply for work in the industries. The high percentage of eldest sons may influence the research results because they represent a selected group,

a factor which should therefore be considered when interpreting the results (McFarlane, 1990).

Table 2.1 indicates that most of the subjects (72%) were responsible for the financial **support of the extended family**. It is assumed that for these subjects it was a priority to stay alive. In fact, Stevens, Calitz and Gagiano (1996) found that the most prevalent underlying psychological theme in treatment-seeking mine employees with PTSD was the fear of dying because it would leave the family without support.

According to the results in table 2.1, the median **mining experience** in terms of years of employment in the mining industry was 18 years. Only 23% had less than 10 years experience. Eighty-one per cent of the subjects had an **academic qualification** lower than standard 6.

Table 2.1 indicates that the majority (95%) were employed in the mining or development areas. **Mining assistants** constituted 35%, **team leaders** 25%, **machine operators** 25%, and **winch drivers** 10% of the sample. Above-mentioned occupations were also found to be at highest risk of exposure to accidents in the gold mine industry (Loss Control Department, 1992). Similarly, Stevens, Calitz and Gagiano (1996) found that treatment-seeking mine employees with PTSD were mostly mining assistants, followed by machine operators, team leaders, and winch drivers.

To summarize, the sample was mostly Sotho-speaking subjects from rural areas who lived in unisexual hostels during periods of employment. They were mainly married, lived in an extended family setup and were also responsible for the financial support of the extended family. They had an academic qualification of less than standard 6 and were mostly employed in the high-risk manual labour occupations. More than 50% were first-born males.

3. ACUTE PTSD GROUP (N=33) COMPARED TO THE NON-PTSD GROUP (N=121)

The acute PTSD group (N=33) and the non-PTSD group (N=121) were compared in terms of the pathogenic factors and the symptoms and signs. The composition of these two groups was described in section 9 of chapter 7. The results are subsequently presented and discussed.

3.1 Modulating factors

The modulating factors were assessed on the Biographic Questionnaire (see 6.1.1 of chapter 7). The results of the acute PTSD group and non-PTSD group are compared and presented in table 3.1.

Table 3.1 Modulating features of the acute PTSD group (N=33) and the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Median age	37 yrs	40 yrs	0.04 (MW)	-6;0
Not married	12%	5%	0.22 (Fis)	-4.6%;19.0%
Not Sotho	46%	29%	0.07 (Chi)	-2.3%;35.3%
Education > st.6	27%	16%	0.24 (Chi)	-4.9%;28.1%
Hostel accommodation	91%	93%	0.72 (Fis)	-12.5%;9.2%
Home in rural areas	94%	97%	0.61 (Fis)	-11.5%;5.9%
Extended family	61%	64%	0.75 (Chi)	-21.8%;15.7%
First-born male	73%	51%	0.03 (Chi)	4.3%;39.5%
Support extend famly	79%	73%	0.48 (Chi)	-9.9%;22.1%
Median years mining	16 yrs	20 yrs	0.01 (MW)	-8;-1
Occupation:				
Mining assistant	58%	27%	0.02 (Fis)	12.5%;49.7%
Team leader	18%	27%		
Winch driver	-	14%		
Machine operator	24%	26%		

MW = Mann-Whitney test

Fis = Fisher's exact test

Chi = Chi-squared test

Table 3.1 indicates that the **median age** of the subjects in the acute PTSD group was 37 and represented the young adulthood life-stage. The median age of the non-PTSD group was 40 and therefore represented the mid years life-stage. Younger employees seemed to be statistically and clinically significantly more liable to develop acute PTSD ($p=0.04$; 95% confidence interval of -6 to 0). Various other studies also reported that younger adults experience more PTSD symptoms, and being young may be a higher risk factor for PTSD (Breslau et al., 1991; Davidson, 1991; Norris, 1992; Ullman, 1995; Ullman & Siegel, 1994).

Subjects who were not married, whether divorced or single, but not living with another women, were counted together and reported as "**not married**". The rest were viewed as living together, whether they were married legally or traditionally, or living together. Table 3.1 indicates a tendency that subjects with acute PTSD were more likely to be not married than subjects without PTSD (95% confidence interval of -4.6% to 19.0%). Stevens et al. (1998a) have found that one of the psychological conflicts married subjects with PTSD experienced was the concern about financial support of the family if the subject could not return to work. It is possible that married men could feel more responsible and motivated to support a family than unmarried men with subsequently less vulnerability in developing PTSD. Various other authors (de Girolamo, 1992; Figley, 1995; Scott & Stradling, 1992; Shalev & Munitz, 1988) have also stated that social support and intense kin relationships are highly supportive and facilitate post-disaster recovery among victims.

Since the majority (67%) of the total sample was Sotho-speaking (see table 2.1), all the other cultural groups were counted together. Table 3.1 indicates a tendency that subjects in the acute PTSD group were more likely to be **non Sotho**-speaking compared to subjects in the non-PTSD group (95% confidence interval of -

2.3% to 35.3%). The Sotho-speaking subjects therefore tended to be less vulnerable in developing acute PTSD. It is possible that the non Sotho-speaking mine employees experienced less emotional support, felt more alienated and lonelier during times of distress in an environment where most employees were Sotho-speaking. This may therefore have increased their risk of developing PTSD. This result could explain White's (1982) inability to explain the reason for higher levels of anxiety in Sotho-speaking mine employees in his studies of stress levels in mine employees. His studies were conducted in Transvaal mines where the majority of employees were Zulu-speaking and Xhosa-speaking.

Table 3.1 indicates that 27% of the acute PTSD group had a standard 6 or higher **education** qualification compared to 16% in the non-PTSD group. Although not statistically significant, a higher percentage of the acute PTSD group tended to have a standard 6 or higher academic qualification (95% confidence interval of -4.9% to 28.1%). These results did not support other reports of a positive relationship between lower education and PTSD (Solomon, Mikulincer, Freid et al., 1987; Breslau et al., 1991) because the better educated subjects tended to be more likely to develop acute PTSD. It could be that these better educated subjects were employed in jobs beneath their educational potential. They may thus have felt alienated in an employee population where the majority (81%; see table 2.1) of employees had a lower than standard 6 education. They may only have taken the job because of an absence of other alternatives. A psychodynamic conflict as to whether to continue underground work or to pursue other alternatives could have developed with a subsequently higher risk for PTSD.

Table 3.1 indicates that 73% of the acute PTSD group were **first-born males** compared to the 51% of the non-PTSD group. This is a statistically and clinically significant difference ($p=0.03$; 95% confidence interval of 4.3% to 39.5%). First-born males thus appeared more likely to develop acute PTSD. No studies were found

on the influence of a subject's position in the family and its relationship with PTSD. It is possible that being the first-born male of an African family could render a person more liable to develop PTSD due to the added stress of being responsible for the extended family. These individuals had to stay alive but also had to continue to work in the dangerous underground environment. The option of life insurance policies did not exist because of limited funds. This conflict producing situation with no escape could thus also have increased the vulnerability to PTSD. The African value system rejects humanistic self-centered life-styles. According to Mbiti (1975), it is only in terms of other people that the individual becomes conscious of his own being, duties, privileges and responsibilities towards himself and other people. Whatever happens to the whole group happens to the individual. Therefore making decisions in favour of egocentric needs, to the detriment of and without consulting the group, creates conflict and anxiety.

Table 3.1 indicates that the acute PTSD group had a median of 16 years **mining experience**, significantly less ($p=0.01$; 95% confidence interval of -8 to -1) than the non-PTSD group (20 years). Subjects with less mining experience therefore appeared to be more liable to develop acute PTSD. The stress resolution perspective (Solomon, 1990; see Chapter 5, paragraph 3.3) may explain this phenomenon. According to this perspective, the outcome of earlier experiences would determine adjustment to later stressors. Therefore, mine employees who are not able to adjust effectively to chronic exposure to danger and news about accidents and deaths of employees in similar circumstances, or to a previous accident, will also be more at risk of having an unsuccessful outcome to new stressors. On the other hand, those mine employees who successfully adjust to similar experiences will continue to adjust successfully to new stressors. It can therefore be assumed that the acute PTSD group was younger, had less mining experience and was not able to cope successfully with previous stressors. By

contrast, the non-PTSD group did not have PTSD because they were able to adjust successfully to previous stressors resulting in enhanced feelings of well-being and improved coping resources.

The results in table 3.1 show that the majority (58%) of the subjects in the acute PTSD group were **mining assistants**. They were significantly more in the acute PTSD group than in the non-PTSD group ($p=0.02$; 95% confidence interval of 12.5% to 49.7%). Mining assistants therefore appeared more likely to develop acute PTSD. White (1982) found mining assistants to be more dissatisfied, alienated and to experience more job-related tension. This may explain their higher prevalence in the acute PTSD group. Mining assistants are also the largest employment group in the stoping and development areas and they may thus be more likely to be involved in trauma and in subsequently developing PTSD.

The results in table 3.1 on **hostel accommodation, home in rural areas**, living in an **extended family** arrangement and **supporting the extended family** were similar for both groups.

To summarize, these results indicate that being unmarried, having less mining experience and being younger, being a non-Sotho, being a first-born male and being employed as a mining assistant, increased the risk of developing acute PTSD.

3.2 Stress factor

The acute PTSD group was compared to the non-PTSD group in terms of exposure to stress factors. The role of the stress factors in the development of acute PTSD was assessed as follows:

1. the influence of previous exposure to trauma as assessed on the Mine Stress Factor Questionnaire;
2. the nature of the precipitating earth-fall accidents as assessed on the Mine Stress Factor Questionnaire;
3. the injury severity as measured on the AIS-90 Abbreviated Injury Scale;
4. the nature of other stressors as assessed on the Holmes-Rahe Stress Scale;
5. the severity of the acute and enduring stressors as measured on the Severity of Psycho-social Stressor Scale (SPSS).

The results are summarized in table 3.2 and are then discussed.

Table 3.2 The stress factors of the acute PTSD group (N=33) compared with those of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
History of previous traumas experienced, and/or witnessed, and/or heard of:				
At least 1 event	79%	81%	0.78 (Chi)	-17.8%;13.4%
At least 2 events	64%	39%	0.01 (Chi)	6.2%;43.4%
At least 3 events	30%	17%	0.08 (Chi)	-3.3%;30.8%
Acute stressor				
At least extreme	100%	74%	<0.01 (Chi)	17.8%;33.4%
Only catastrophic	91%	46%	<0.01 (Chi)	32.2%;58.7%
Nature of earth-fall accident:				
Life in danger				
Experience	94%	46%	<0.01 (Fis)	35.6%;59.7%
Witness	-	3%		
Colleague injured				
Experience	21%	41%	0.10 (Chi)	-36.6%;-3.6%
Witness	6%	6%		
Injury				
Experience	79%	35%	<0.01 (Fis)	27.8%;60.4%
Witness	-	3%		
Pinned by rocks				
Experience	39%	8%	<0.01 (Chi)	13.8%;48.5%
Witness	15%	21%		
Trapped				
Experience	-	2%	1.00 (Fis)	-3.9%;0.6%

Witness	-	-		
Alone during accident				
Experience	6%	3%	0.69 (Fis)	-5.9%;11.5%
Witness	-	1%		
Unexpected				
Experience	94%	79%	0.12 (Fis)	4.5%;26.4%
Witness	-	-		
No ventilation				
Experience	27%	5%	<0.01 (Fis)	6.6%;38.0%
Witness	-	-		
No light				
Experience	39%	7%	<0.01 (Fis)	14.6%;49.3%
Witness	-	-		
Rescue assistance				
Experience	12%	19%		
Witness	39%	13%	<0.01 (Chi)	-20.0%;6.3%
Desert accident scene immediately				
Experience	6%	7%		
Witness	12%	3%	0.06 (Fis)	-1.8%;21.1%
Suffocation				
Experience	24%	3%	<0.01 (Fis)	6.9%;36.6%
Witness	-	-		
Knock on head				
Experience	24%	5%	<0.01 (Fis)	2.4%;32.9%
Witness	1%	1%		
Unconscious				
Experience	30%	7%	<0.01 (Fis)	6.5%;39.2%
Witness	3%	1%		
Thought it would happen				
Experience	30%	33%	0.77 (Chi)	-20.5%;15.0%
Witness	-	-		
Horror				
Experience	91%	43%	<0.01 (Fis)	34.7%;61.1%
Witness	-	-		
Intense fear				
Experience	100%	77%	<0.01 (Chi)	15.6%;30.7%
Witness	-	-		
Helplessness				
Experience	94%	49%	<0.01 (Chi)	33.1%;57.2%
Witness	-	-		
Hear colleagues cry	21%	20%	0.88 (Chi)	-14.5%;16.9%
Not return work	39%	17%	<0.01 (Chi)	4.9%;40.8%
Severity of injury:				
No injury	21%	60%		
Minor/moderate	52%	35%		
Severe/life threat	27%	5%	<0.01 (Chi)	6.6%;38.0%
Enduring stressors:				
At least extreme	15%	3%	0.02 (Fis)	-0.8%;24.5%
Other Stressors:				
Death of spouse	-	2%	1.00 (Fis)	-3.9%;0.6%
Divorce/Separation	-	-		
Death in family	46%	25%	0.02 (Chi)	2.0%;39.3%
Marriage	9%	2%	0.11 (Fis)	-3.6%;16.8%
Illness in family	24%	14%	0.16 (Chi)	-5.7%;26.1%
Sexual problems	12%	12%	1.00 (Fis)	-12%;13.1%

Newborn baby	6%	9%	0.74 (Fis)	-12.6%;6.6%
Death of friend	15%	7%	0.15 (Fis)	-4.5%;21.5%
Change of work	9%	3%	0.17 (Fis)	-4.5%;16.1%
Problems in-laws	9%	3%	0.17 (Fis)	-4.5%;16.1%
Supervisor problem	12%	0%	<0.01 (Fis)	0.9%;23.3%
Change work hours	6%	5%	0.68 (Fis)	-7.9%;10.1%
See family only weekends				
or on holidays	85%	90%	0.37 (Fis)	-18.6%;8.1%
Less than month ago				
on leave	6%	8%	1.00 (Fis)	-11.7%;7.3%
More than 6 months				
ago on leave	67%	64%	0.75 (Chi)	-15.2%;21.3%
Leave due within				
3 weeks	21%	16%	0.45 (Chi)	-9.9%;20.9%
Miscellaneous	21%	10%	0.13 (Fis)	-3.6%;26.2%

Fis = Fisher's exact test

Chi = Chi-squared test

3.2.1 Trauma history as assessed on the Mine Stress Factor Questionnaire

The subjects were asked whether they had experienced and/or witnessed, and/or heard of one, two or more than three previous traumatic incidents. The experienced, and/or witnessed and/or, heard of previous traumatic events responses were combined. Positive responses to one, or two or three of the possible alternatives were counted as only one positive response.

Table 3.2 indicates that most of the subjects in both the acute PTSD group (79%) and the non-PTSD group (81%) were previously exposed to **at least one traumatic event**. Significantly more ($p=0.01$; 95% confidence interval of 6.2% to 43.4%) subjects in the acute PTSD group (64%) were exposed to **at least two previous traumatic events** compared to the non-PTSD group (39%). Subjects exposed to **at least three traumatic events** also seemed more likely to have been in the acute PTSD group than in the non-PTSD group (95% confidence interval of -3.3 to 30.8).

These results supported the statement that "the more the exposure to trauma the higher the risk of developing PTSD" as shown in the linear relationship found

between the number of traumatic events and PTSD (Solomon, 1993; Solomon, Mikulincer & Jacob, 1987) therefore supporting the stress vulnerability perspective (Selye, 1976).

Contrary to the above-mentioned statement, 17% of non-PTSD group were previously exposed to at least three traumatic events. They may have developed a stress tolerance, which therefore supports the stress inoculation perspective (Epstein, cited in Solomon, 1990, p.117) and/or stress resolution perspective (Solomon, 1990; see chapter 5, paragraph 3.3).

3.2.2 Severity of the earth-fall accidents as measured on the Severity of Psycho Social Stressor Scale

Table 3.2 indicates that the earth-fall accidents (acute stressor) were experienced as extreme by 100% and as catastrophic by 91% of the acute PTSD group. This was significantly worse than the non-PTSD group (extreme: $p < 0.01$; 95% confidence interval of 17.8% to 33.4%; catastrophic: $p < 0.01$; 95% confidence interval of 32.2% to 58.7%).

3.2.3 Nature of the earth-fall accidents as assessed on the Mine Stress Factor Questionnaire

According to the results in table 3.2 most subjects (94%) in the acute PTSD group thought their **lives** were **in danger** during the earth-fall event, which was significantly more ($p < 0.01$) than the non-PTSD group (46%).

When a subject witnessed a **colleague** being **injured**, the response was ticked as "experienced" on the item "A colleague was injured". When a subject only saw the injured person after the accident, then the response was ticked as "witness".

Table 3.2 indicates that 41% of the non-PTSD group "experienced" their colleagues being injured. They appeared more likely to have experienced their colleagues being injured (95% confidence interval of -36.6% to -3.6%) than the acute PTSD group (21%). The fact that the majority (79%) of the acute PTSD group was **injured** may explain this tendency.

Rocks pinned a person when earth and rocks fell on him during an accident.

Table 3.1 indicates that 39% of the acute PTSD group, significantly more ($p < 0.01$) than the non PTSD group (8%), were pinned by rocks during the earth-fall accident.

A person was **trapped** when an accident prevented exit. A trapped person is not necessarily injured or pinned by rocks. According to the results in table 3.2 this was experienced by only two subjects (2%) in the non-PTSD group and to none in the acute PTSD group. An accident happening to a person when **alone** in a specific area may be experienced as traumatic. Only 6% of the acute PTSD group and 3% of the non-PTSD group perceived themselves as being alone during their accidents.

Table 3.2 indicates that the majorities of subjects in the acute PTSD group (94%) and in the non-PTSD group (79%) experienced the earth-fall event as **unexpected**. However, it seemed more likely in the acute PTSD group (95% confidence interval of 4.5% to 26.4%). The high percentage of subjects in the non-PTSD group that experienced the event as unexpected seemed to be an indication of the severity of the earth-fall accidents.

Most underground working areas are ventilated and electrically lit. All miners also carry headlamps to provide light in the dark working areas. During an accident **ventilation** and/or electrical supply of **light** and/or headlamps may be

damaged. Table 3.2 indicates that 27% and 39% of the acute PTSD group experienced a lack of ventilation and an absence of light, which was significantly more ($p < 0.01$) than the non-PTSD group (5% and 7%).

A person experienced "**rescue assistance**" when he actively assisted in rescuing affected colleagues. Table 3.2 indicates that significantly more subjects ($p < 0.01$) in the acute PTSD group witnessed rescue assistance (39%) instead of experiencing it, when compared to the non-PTSD group (13%). The fact that significantly more subjects in the acute PTSD group were **injured** ($p < 0.01$), experienced **intense fear** ($p < 0.01$), **horror** ($p < 0.01$) and **feelings of helplessness** ($p < 0.01$) than subjects in the non-PTSD group, could explain this.

A person may either have **deserted the accident scene** immediately after the event, or he may have witnessed a colleague doing it. Table 3.2 indicates a tendency for more subjects with acute PTSD (95% confidence interval of -1.8% to 21.1%) to have witnessed other employees fleeing from the accident scene without helping with rescue attempts when compared to the non-PTSD group.

Suffocation was experienced when a person found it difficult to breathe as a result of the earth-fall accident. According to the results in table 3.2, significantly more subjects in the acute PTSD group experienced suffocation ($p < 0.01$), **knock on the head** ($p < 0.01$), and were rendered **unconscious** ($p < 0.01$) by the earth-fall accidents than subjects in the non-PTSD group. All these experiences were aspects that may have increased the level of intensity of the earth-fall accidents.

Table 3.2 indicates that 30% of the acute PTSD group and 33% of the non-PTSD group always **thought a mine accident would happen** to them.

Some of the subjects may not have **returned to their work** after the accident, because of sick leave, for example. Table 3.2 shows that significantly ($p < 0.01$) more subjects in the acute PTSD group (39%) had not yet returned to work at the first assessment session when compared to the non-PTSD group (17%). The higher prevalence of injuries as well as the PTSD symptoms in the acute PTSD group may explain this.

Subjects who thought their lives were in danger were more vulnerable to develop acute PTSD. The response to this item may have been related to the subjects' perception of the event. The way events are perceived and analysed may exert far more influence upon the pathogenic process than does the mere exposure alone (Feinstein, 1993; Scrignar, 1988; Shalev & Munitz, 1988; Solomon, 1993; Wilson, 1989).

Witnessing and/or "experiencing" a person being injured did not seem to predispose and to be enough to precipitate acute PTSD. The DSM-IV (APA, 1994) states that an event should, for example, also be experienced with intense fear before it can be defined as traumatic.

Being pinned by rocks appeared to be highly associated with acute PTSD. Being pinned by rocks hundreds of meters underground is possibly one of the most severe and intense forms of exposure to mine trauma.

Subjects who experienced the earth-fall events as unexpected tended to be more vulnerable to develop acute PTSD. Various authors have indicated that level of preparedness for a traumatic event contributes to trauma experience (Baum, 1987; Miller et al., 1993).

Subjects who experienced absence of light and fresh air during the traumatic event were more liable to develop acute PTSD. Under earth-fall circumstances the availability of fresh air and light could reduce the impact of the event. Light may provide a sense of control and orientation. The absence of these factors could therefore have predisposed the acute PTSD group to develop PTSD.

Subjects who did not help in the rescuing process appeared more liable to develop acute PTSD. These results may have supported statements by the WHO (1992b) that stress is better endured as an active participant than as passive victim, or it may be due to their just being too injured themselves.

Subjects with acute PTSD tended to be more likely to witness colleagues deserting the accident scene. It is possible that such an experience would trigger reproachful feelings and behaviour. Blaming others has been found to be associated with poorer physical and emotional outcomes (Tarrier, 1995).

Subjects who experienced unconsciousness during accidents were more liable to develop acute PTSD. These results supported theories, for example the multiple memory system theory, which argue that individuals who were unconscious during the traumatic event may still develop PTSD (Horton, 1995; Layton & Wardi-Zonna, 1995).

Sometimes individuals may actively worry that they may get injured underground, although not necessarily expecting it at a particular moment. This worry may also represent a type of anticipatory anxiety. The fact that almost one-third of both groups always "thought that a mine accident may happen to them" seemed to indicate the awareness these subjects had for danger. It may be verification of the statement that mining is a high-risk occupation.

In general these results indicated that the acute PTSD group experienced the earth-fall event with more intensity and severity than the non-PTSD group did. It seemed that the intensity and severity of exposure to the earth-fall accidents predisposed these subjects to develop PTSD. These results supported the various reports that found a consistent association between intensity of traumatic events and the subsequent development of PTSD (Lee, Vaillant, Torrey, & Elder, 1995; Goldberg, True, Eisen, & Henderson, 1990; McFarlane, 1986; 1987; 1990; Reich, 1990; Shalev & Munitz, 1988; Shore et al., 1986).

3.2.4 Injury severity as measured on the AIS-90 Abbreviated Injury Scale

Table 3.2 indicates that minor/moderate and severe levels of injuries were significantly more ($p < 0.01$) in the acute PTSD group when compared to the non-PTSD group. Injuries therefore seemed to have predisposed subjects to develop acute PTSD, supporting other studies that indicated that being injured increases the risk of developing PTSD (Attah Johnson, 1990; Desivilya, Gal, & Ayalon, 1996; Feinstein & Dolan, 1991; Helzer et al., 1987; Scrignar, 1988; Shalev & Munitz, 1988).

3.2.5 Severity of the enduring stressors as measured on the Severity of Psycho Social Stressor Scale

Table 3.2 indicates that extreme levels of enduring stress seemed to have affected the morbidity of subjects because significantly more ($p = 0.02$) subjects in the acute PTSD group (15%) experienced at least extreme levels of enduring stress than did the non-PTSD group (3%). The rest of the subjects experienced moderate to severe levels of enduring stress due to the absence of a social support network when at work, the financial responsibility towards the extended

family (see table 3.1) and the stressful working environment. Yet 121 (67%) of the total sample (the non PTSD group) did not develop PTSD.

These results supported reports that indicate that pre-existing high levels of stress may contribute to render individuals, who are exposed to traumatic events, more liable to develop subsequent PTSD (APA, 1994; Scrignar, 1988). The majority of the sample experienced moderate to severe levels of enduring stress and still did not develop PTSD. This is possibly because the mineworkers from the rural areas are a selected group.

3.2.6 Other stressors as assessed on the Holmes-Rahe Stress Scale

Table 3.2 indicates that 46% of the acute PTSD group experienced first or second degree **familial death**, significantly more than did the non-PTSD group ($p=0.02$). Although not reported, it was usually uncles or aunts or parents that died. There seemed to be slight tendencies that **marriage** (95% confidence interval of -3.6% to 16.8%), **illness in the family** (95% confidence interval of -5.7% to 26.1%), **death of a friend** (95% confidence interval of -4.5% to 21.5%), **problems with in-laws** (95% confidence interval of -4.5% to 16.1%) were experienced by more subjects in the acute PTSD group than in the non-PTSD group. Although only 12% of acute PTSD group experienced **problems with their supervisors**, this was significantly ($p<0.01$) more than in the non-PTSD group (0%).

Other factors unique to the employees in the mining industry were also assessed. These include the stress employees experience prior to going on leave, when returning from leave, and when employees have not been home for more than three to six months. The results were similar for both groups.

The acute PTSD group tended to be more exposed to various types of stressors before the earth-fall accident, which could therefore have predisposed them to develop acute PTSD. It supported other reports that said that presence of other stressors prior to a traumatic event could place victims at increased risk for the development of PTSD (APA, 1994, Scrignar, 1988, Solomon, 1993).

3.2.7 Intensity of trauma versus a history of trauma in predicting PTSD

The history of at least two traumatic event exposures prior to the earth-fall event were compared with the intensity of the precipitating earth-fall event in predicting acute PTSD. The results are summarized in table 3.3 and table 3.4.

Table 3.3 History of trauma compared to the intensity of the earth-fall accident in the acute PTSD group (N=33).

PREVIOUS TRAUMA EXPERIENCE	INTENSITY OF EARTH-FALL ACCIDENT (N=33)				Total	
	Not catastrophic		Catastrophic			
Experience	-	-	8	100%	8	24.2%
Witnessed	1	11%	8	89%	9	27.3%
None	1	8%	11	92%	12	36.4%
Heard about	1	25%	3	75%	4	12.1%
Total	3	9%	30	91%	33	100%

Table 3.4 History of trauma compared to intensity of the earth-fall accident in the non-PTSD group (N=121).

PREVIOUS TRAUMA EXPERIENCE	INTENSITY OF EARTH-FALL ACCIDENT (N=121)				Total	
	Not catastrophic		Catastrophic			
Experience	15	65%	8	35%	23	19.0%
Witnessed	11	55%	9	45%	20	16.5%
None	36	45%	38	51%	74	61.2%
Heard about	4	100%	-	-	4	3.3%
Total	66	54.5%	55	45.5%	121	100%

Table 3.3 indicates that all the subjects (8; 100%) in the acute PTSD group who experienced two or more previous traumatic events also experienced the

precipitating earth-fall accident as catastrophic. Eighty-nine per cent (8) of the acute PTSD group who witnessed, 92% (11) who were not exposed on any way (none) to previous trauma, and 75% (3) who heard about a traumatic event, also experienced the precipitating earth-fall event as catastrophic.

On the other hand, table 3.4 shows that only 34% of the subjects in the non-PTSD group who experienced at least two traumatic events also experienced the earth-fall event as catastrophic. Furthermore, 45% (9) of the non-PTSD group who witnessed, 51% (38) who were not exposed in any way (0) to previous trauma also experienced the precipitating earth-fall event as catastrophic.

These results therefore indicate that the intensity of the earth-fall event played a more important role than previous trauma in the pathogenesis of the subjects with acute PTSD. Kemp et al. (1995) added that even though previous trauma might predict PTSD, it was a weaker predictor than the intensity of the current traumatic event.

To summarize, the results on stress factors indicate that significantly more subjects in the acute PTSD group experienced a history of more than two previous traumatic events, more severe levels acute stress (earth-fall accident), and more severe levels of chronic stress. Subjects with injuries were also more liable to develop acute PTSD. It seemed that trauma intensity was more important than the number of previous traumas experienced in predisposing subjects to develop acute PTSD. It thus appeared that a history of traumatic events, severity levels of the acute and chronic stress, and injury, predisposed subjects to develop acute PTSD.

3.3 Predisposing factors

The acute PTSD group was compared with the non-PTSD group in terms of personal and family histories of psychiatric disorders. A family history of psychiatric disorders was assessed on the Genetic Classification Questionnaire. A personal history of psychiatric problems was evaluated on the Primary and Secondary Nosology Classification Questionnaire.

The results are summarized in table 3.5 and then discussed.

Table 3.5 Family and personal histories of psychiatric disorders in the acute PTSD group (N=33) compared with the histories of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Family history:				
PTSD spectrum	49%	31%	0.06 (Chi)	-1.3%;36.6%
Psychiatric history:				
Primary PTSD	39%	18%	0.01 (Chi)	3.2%;39.2%
Secondary PTSD	36%	23%	0.13 (Chi)	-4.8%;31.3%
Alcohol primary	12%	9%	0.74 (Fis)	-9.2%;15.3%
Cannabis primary	9%	10%	1.00 (Fis)	-12.0%;10.3%
Phobia primary	6%	1%	0.12 (Fis)	-3.1%;13.5%
Anxiety primary	6%	5%	0.68 (Fis)	-7.9%;10.1%
Somatoform primary	3%	0%	0.21 (Fis)	-2.8%;8.9%
Depression primary	21%	3%	<0.01 (Fis)	3.6%;32.2%

Chi = Chi-squared Test

Fis = Fisher's Exact Test

3.3.1 Family history as assessed on the Genetic Classification Questionnaire

Familial true PTSD:

A family history of only PTSD (family true PTSD) could not be determined because the subjects were not able to say whether their parents had experienced traumatic events. Secondly, subjects did not understand the concept PTSD. They were also not able to associate any culture-bound syndrome with trauma-related symptoms. However, some subjects did explain the reason for the traumatic event in terms of culture-bound beliefs, for example, bewitchment.

PTSD spectrum illness:

In this study a PTSD spectrum illness refers to the presence of a familial history of depression, anxiety disorders, psychotic disorders, alcohol dependency and anti-social personality. Table 3.5 indicates that nearly half (49%) of the acute PTSD group had a family history of psychiatric disorders. The acute PTSD group seemed more likely to have had a family history of psychiatric disorders than the non-PTSD group ($p=0.06$; 95% confidence interval of -1.3% to 36.6%). A family history of psychiatric syndromes may thus have increased the risk of these subjects to develop PTSD. These results support other studies that found an association between a family history of psychiatric syndromes and PTSD (Davidson et al., 1991; McFarlane, 1990). Stevens, Gagiano and Calitz (1996) also found that 50% of treatment-seeking patients with PTSD had a family history of PTSD.

3.3.2 Psychiatric history as assessed on the Primary and Secondary Nosology Classification Questionnaire

Primary PTSD:

Primary PTSD refers to subjects with acute PTSD who had a previous history of PTSD. Primary PTSD is also referred to as reactivated PTSD (Solomon, 1990; 1993). Table 3.5 indicates that 39% of the acute PTSD group had a premorbid history of PTSD, significantly more ($p=0.01$; 95% confidence interval of 3.2% to 39.2%) than the 18% of the non-PTSD group. Subjects with a previous PTSD were therefore more likely to have developed acute PTSD. These results supported the findings of Solomon (1993) that subjects with prior episodes of PTSD are more vulnerable to develop a reactivated PTSD after exposure to new stressors and that individuals with reactivated PTSD have lower expectations of coping positively.

Secondary PTSD:

Secondary PTSD refers to the presence of other psychiatric disorders prior to the development of the PTSD. Table 3.5 indicates that more subjects in the acute PTSD group (36%) tended to have secondary PTSD than subjects in the non-PTSD group (23%; 95% CI of -4.8% to 31.3%). This factor was difficult to assess because the presence or absence of prior psychiatric disorders could not be reliably verified. It was possible, for example, that subjects could have denied the presence of a prior substance abuse disorder.

Table 3.5 shows that only major depression was premorbidly experienced by significantly more subjects in the acute PTSD group than subjects in the non-PTSD group ($p<0.01$; 95% CI of 3.6% to 32.2%). Only 12% of the acute PTSD group and 9%

of the non-PTSD group had primary alcohol abuse/dependency disorder. The other results in table 3.5 were insignificant.

These results supported other studies that also indicated that people with a history of psychiatric disease are more vulnerable to develop PTSD when exposed to trauma (Breslau et al., 1991; Davidson, Swartz et al., 1985; McFarlane, 1990; North et al., 1989; Sierles, Chen, McFarland, & Taylor, 1983). Subjects with premorbid depression were especially more vulnerable to acute PTSD. Other researchers also indicated that individuals with depression are at an increased risk of developing PTSD (Moore & Boehnlein, 1991). Alcohol abuse did not seem to have played a role in predisposing these subjects to develop acute PTSD. The low prevalence of alcohol abuse/dependency in these subjects could be related to the selected nature of the research group. These results supported other studies that did not find a high association between PTSD and alcohol abuse/dependency (Green et al., 1989; Kinzie 1993; North et al., 1989) and suggested that PTSD should not be stereotypically linked with substance abuse.

To summarize, these results indicate that a family history of psychiatric disease predisposed subjects to develop acute PTSD. Furthermore, a psychiatric history and, more specifically, a history of previous PTSD and major depressive disorders rendered subjects more vulnerable to acute PTSD

The subjects in the acute PTSD group with a premorbid history of PTSD (primary PTSD) constituted the primary acute PTSD group (N=13). The rest of the acute PTSD group constituted the new acute PTSD group (N=20; see figure 3 in chapter 7). These two groups within the acute PTSD group were compared and the results are subsequently presented and discussed.

3.3.2.1 Primary acute PTSD group (N=13) compared to new acute PTSD group (N=20)

The primary acute PTSD group (N=13) was compared to the new PTSD group (N=20) only in terms of the symptoms and signs. The pathogenesis of the two groups differed per definition since one group had a previous history of PTSD. The results are presented and discussed in the following order:

1. the severity of the PTSD as measured on the HTQ;
2. the severity of the intrusive and avoidance symptoms as measured on the IES;
3. the comorbid diagnoses received by each group as measured on the HDRS and the HARS;
4. the deterioration of the general levels of functioning as measured on the GAF scale;
5. the severity of the different DSM-IV PTSD symptoms and the positive response rate received by each symptom as measured on the HTQ;
6. the associated symptoms experienced by each group as measured on the HTQ.

Results on the HTQ, IES, HARS, HDRS and GAF:

The HTQ, IES, HARS, HDRS, and the GAF scores are presented in table 3.5.1 and are then discussed.

Table 3.5.1 A comparison of the HTQ scores, the IES scores, the HARS scores, the HDRS scores, and the GAF scores of the primary acute PTSD group (N=13) and new acute PTSD group (N=20).

	Primary Acute PTSD group (N=13)	New Acute PTSD group (N=20)	p-value*	95% CI for difference prim acute PTSD group minus new acute PTSD group
Median HTQ PTSD score	2.6	2.2	0.01	0.06;0.75
Median HTQ Total score	2.3	2.0	0.08	-0.07;0.6
Median IES	51	41	0.09	-2;16
Median Intrusive	21	19	0.11	-1;10
Median Avoidance	26	23	0.19	-2;7
Median HARS score	17	11	0.19	-2;12
Median Psychic anxiety	15	10	0.10	-1;9
Median Somatic anxiety	3	3	0.62	-3;3
Median HDRS score	16	11	0.14	-1;10
Median GAF score	20	20	0.35	-5;5

* = Mann-Whitney Test

Table 3.5.1 indicates that the HTQ PTSD score of the primary acute PTSD group was 2.6, significantly more than the score (2.2) of the new acute PTSD group ($p < 0.01$; 95% confidence interval of 0.06 to 0.75). It meant that the PTSD symptoms experienced by the primary acute PTSD group were significantly more severe than that of the new acute PTSD group.

Although not statistically significant, the results in table 3.5.1 indicate that the primary acute PTSD group had higher scores on all the scales compared with the scores of the new acute PTSD group. The PTSD symptoms (HTQ scores), the intrusive and avoidance symptoms (IES scores), the depressive symptoms (HDRS score), the anxiety symptoms (HARS score) and the impairment of functioning (GAF

score) of the primary acute PTSD group all tended to be more severe than those of the new acute PTSD group.

Although the small group sizes could have influenced the reliability of interpretations it seemed that these results supported the findings of Solomon (1993) that reactivated PTSD was more severe and longer lasting than first time PTSD. These results therefore seemed to indicate that mine employees with a reactivated/primary PTSD due to earth-fall accidents might have more severe PTSD symptoms than mine employees with a first time PTSD due to earth-fall accidents. The primary acute PTSD group also appeared more vulnerable to generalized anxiety disorder and major depressive disorder.

PTSD symptoms as measured on the HTQ:

The positive response rates and the severity of the PTSD symptoms, as measured on the HTQ, of the primary acute PTSD group were compared with those of the new acute PTSD group. The results are presented in table 3.5.2 and then discussed.

Table 3.5.2 The PTSD symptoms of the primary acute PTSD group (N=13) compared to those of the new acute PTSD group (N=20).

	Primary Acute PTSD group (N=13)	New Acute PTSD group (N=20)	p-value	95% CI for difference prim acute PTSD group minus new acute PTSD group
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Cluster B: Re-experiencing symptoms

Intrusive recollections

little bit	3	23%	5	25%	0.26(Fis)	-6.6%;29.6%
quite a bit	7	54%	6	32%		
extremely	3	23%	8	40%		
Total positives	13	100%	17	85%		

Distressing dreams

little bit	4	31%	3	15%
quite a bit	3	23%	2	10%

extremely	2	15%	2	10%	
Total positives	9	69%	7	35%	0.06 (Chi) -0.7%;61.5%

Reenactment

little bit	3	23%	5	25%	
quite a bit	8	62%	6	30%	
extremely	2	15%	5	25%	
Total positives	13	100%	16	80%	0.14 (Fis) -3.3%;35.5%

Psychological distress

little bit	4	31%	8	40%	
quite a bit	3	23%	8	40%	
extremely	6	46%	4	20%	
Total positives	13	100%	20	100%	

Physiological reactivity

little bit	4	31%	8	40%	
quite a bit	3	23%	8	40%	
extremely	6	46%	4	20%	
Total positives	13	100%	20	100%	

Cluster C: Avoidance symptomatology**Avoid thoughts/ feelings/ conversations**

little bit	2	15%	2	10%	
quite a bit	4	31%	11	55%	
extremely	7	54%	6	30%	
Total positives	13	100%	19	95%	1.00 (Fis) -11.9%;16.7%

Avoid activities/ places/ people

little bit	4	31%	10	50%	
quite a bit	6	46%	6	30%	
extremely	2	15%	4	20%	
Total positives	12	92%	20	100%	0.39 (Fis) -25.9%;8.2%

Inability to recall

little bit	3	23%	2	10%	
quite a bit	3	23%	3	15%	
extremely	1	8%	2	10%	
Total positives	7	54%	7	35%	0.28 (Chi) -15.3%;49.4%

Diminished interest/ participation

little bit	2	15%	5	25%	
quite a bit	7	54%	7	35%	
extremely	2	15%	1	5%	
Total positives	11	85%	13	65%	0.26 (Fis) -11.5%;44.3%

Detachment/ estrangement

little bit	4	31%	6	30%	
quite a bit	4	31%	4	20%	
extremely	3	23%	-	-	
Total positives	11	85%	10	50%	0.07 (Fis) 1.6%;58.6%

Restricted affect

little bit	3	23%	10	50%	
quite a bit	5	39%	8	40%	
extremely	5	39%	2	10%	
Total positives	13	100%	20	100%	

Foreshortened future

little bit	5	39%	7	35%	
quite a bit	2	15%	4	20%	
extremely	4	31%	4	20%	
Total positives	11	85%	15	75%	0.68 (Fis) -19.5%;34.1%

Cluster D: Symptoms of increased arousal**Difficult fall/stay asleep**

little bit	2	15%	9	45%	
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quite a bit	5	39%	6	30%		
extremely	5	39%	2	10%		
Total positives	12	92%	17	85%	1.00(Fis)	-17.3%;26.9%
Irritability/ anger outbursts						
little bit	3	23%	5	25%		
quite a bit	4	31%	2	10%		
extremely	1	8%	1	4%		
Total positives	8	62%	8	40%	0.23(Chi)	-13.1%;51.4%
Difficulty concentrating						
little bit	5	39%	10	50%		
quite a bit	6	46%	2	10%		
extremely	1	8%	2	10%		
Total positives	12	92%	14	70%	0.20(Fis)	-6.3%;43.4%
Hypervigilance						
little bit	5	39%	8	40%		
quite a bit	3	23%	3	15%		
extremely	2	15%	-	-		
Total positives	10	77%	11	55%	0.28(Fis)	-11.4%;49.1%
Startle response						
little bit	-	-	3	15%		
quite a bit	6	46%	2	10%		
extremely	-	-	3	15%		
Total positives	6	46%	8	40%	0.73(Chi)	-26.9%;38.5%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.5.2 indicates that the primary acute PTSD group experienced more DSM-V PTSD symptoms than did the new acute PTSD group. Distressing dreams tended to be experienced significantly more by the primary acute PTSD group than the new PTSD group (95% confidence interval of -0.7% to 61.5%). Feelings of estrangement and detachment were the only DSM-IV PTSD criterion experienced clinically significantly more by primary acute PTSD group than the new acute PTSD group (95% confidence interval of 1.6% to 58.6%). The other results were insignificant.

These results indicate that subjects with a history of PTSD were more likely to develop distressing dreams and symptoms of estrangement and detachment than new PTSD cases. Distressing dreams have been associated with chronic PTSD (Friedman, 1988, Solomon, 1993; Weiss, 1993). A literature search did not provide any information on prevalence of nightmares in new PTSD cases as opposed to victims with prior PTSD. These results indicated that chronic PTSD might share the same dynamics as reactivated PTSD.

According to van der Kolk (1988), victims of trauma lose confidence in their ability to influence the course of their lives. They may then tend to withdraw themselves from other people and have a diminished level of social functioning (Solomon, 1990; Williams, 1993). It could therefore be that these subjects with previous episodes of PTSD might have withdrawn themselves more and more from life. They may have believed that they had no control over their lives due to their re-exposure to trauma with subsequent anxiety symptoms. Those subjects who did not have a history of previous PTSD might not yet have experienced the feeling of loss of control as severely.

Associated PTSD symptoms as measured on the HTQ:

The positive response rates and the severity of the associated symptoms, as measured by the HTQ, of the primary acute PTSD group were compared with those of the new acute PTSD group. The results are presented in table 3.5.3 and then discussed.

Table 3.5.3 The associated PTSD symptoms of the primary acute PTSD group (N=13) compared with those of the new acute PTSD group (N=20).

	Primary Acute PTSD group (N=13)	New Acute PTSD group (N=20)	p-value	95% CI for difference prim acute PTSD group minus new acute PTSD group
Nobody understands				
little bit	3 23%	2 10%		
quite a bit	4 31%	2 10%		
extremely	- -	2 10%		
Total positives	7 54%	6 30%	0.17 (Chi)	-10.3%;53.6%
Impairment function				
little bit	5 39%	5 25%		
quite a bit	7 54%	11 55%		
extremely	1 8%	2 10%		

Total positives	13	100%	18	90%	0.17 (Chi)	-9.5%;23.4%
Blaming self						
little bit	2	15%	3	15%		
quite a bit	2	15%	4	20%		
extremely	3	23%	2	15%		
Total positives	7	54%	10	50%	0.83 (Chi)	-29.6%;36.3%
Blaming others						
little bit	1	8%	-	-		
quite a bit	-	-	-	-		
extremely	-	-	3	15%		
Total positives	1	8%	3	15%	1.00 (Fis)	-26.9%;17.3%
Survival guilt						
little bit	-	-	-	-		
quite a bit	-	-	-	-		
extremely	-	-	1	5%		
Total positives	-	-	1	5%	1.00 (Fis)	-16.7%;11.9%
Hopelessness						
little bit	3	23%	4	20%		
quite a bit	2	15%	3	15%		
extremely	3	23%	2	10%		
Total positives	8	62%	9	45%	0.35 (Chi)	-17.8%;47.0%
Ashamed						
little bit	3	23%	5	25%		
quite a bit	1	8%	4	20%		
extremely	5	39%	8	40%		
Total positives	9	69%	17	85%	0.39 (Fis)	-43.7%;13.3%
Thinking "why me?"						
little bit	3	23%	4	20%		
quite a bit	2	15%	3	15%		
extremely	5	39%	9	45%		
Total positives	10	77%	16	80%	1.00 (Fis)	-31.9%;23.9%
Thinking "only me"						
little bit	3	23%	4	20%		
quite a bit	2	15%	2	10%		
extremely	2	15%	1	5%		
Total positives	7	54%	7	35%	0.28 (Chi)	-15.3%;49.4%
Feel going crazy						
little bit	2	15%	1	5%		
quite a bit	1	8%	2	10%		
extremely	2	15%	-	-		
Total positives	5	39%	3	15%	0.21 (Fis)	-7.5%;51.4%
Others are hostile						
little bit	1	8%	1	5%		
quite a bit	1	8%	4	20%		
extremely	-	-	-	-		
Total positives	2	15%	5	25%	0.68 (Fis)	-34.1%;19.5%
No one to rely on						
little bit	-	-	1	5%		
quite a bit	-	-	1	5%		
extremely	2	15%	1	5%		
Total positives	2	15%	3	15%	1.00 (Fis)	-23.1%;36.2%
Depersonalization						
little bit	2	15%	1	5%		
quite a bit	1	8%	-	-		
extremely	1	8%	1	5%		
Total positives	4	31%	2	10%	0.18 (Fis)	-7.7%;47.3%
Feel betrayed						
little bit	-	-	1	5%		

quite a bit	-	-	-	-		
extremely	-	-	-	-		
Total positives	-	-	1	5%	1.00 (Fis)	-16.7%;11.9%
Ancestors' message						
little bit	3	23%	3	15%		
quite a bit	-	-	-	-		
extremely	1	8%	1	5%		
Total positives	4	31%	4	20%	0.68 (Fis)	-18.7%;40.0%
Bewitched						
little bit	1	8%	-	-		
quite a bit	1	8%	1	5%		
extremely	2	15%	3	15%		
Total positives	4	31%	4	20%	0.68 (Fis)	-18.7%;40.0%
Ignored rituals						
little bit	1	8%	-	-		
quite a bit	-	-	1	5%		
extremely	-	-	-	-		
Total positives	1	8%	1	5%	1.00 (Fis)	-14.8%;23.4%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.5.3 indicates that the primary acute PTSD group did not differ significantly from the new acute PTSD group in terms of the associated PTSD symptoms. It therefore seemed that the primary acute PTSD group and the new acute PTSD group differed more regarding the DSM-IV PTSD symptoms. The small sample size might have contributed to the insignificance of the differences.

Unfortunately, few other studies investigated the reactivated PTSD phenomenon since few people are exposed to similar stressors (Solomon, 1993). Studies that did investigate symptom manifestations of reactivated PTSD give few facts about symptom manifestations but more about the general levels of reactivated PTSD severity (Solomon, 1990). However, these results do indicate that subjects with primary PTSD experienced symptoms more severely than did those subjects without a previous history of PTSD.

The acute PTSD group is subsequently compared with the non-PTSD group in terms of the symptoms and signs.

3.4 Symptoms and signs

The symptoms and signs of the acute PTSD group (N=33) were compared with those of the non-PTSD group (N=121) and are presented and discussed in the following order:

1. the severity of the PTSD as measured on the HTQ;
2. the severity of the intrusive and avoidance symptoms as measured on the IES;
3. the deterioration of the general levels of functioning as measured on the GAF scale;
4. the severity of the different DSM-IV PTSD symptoms and the positive response rate received by each symptom as measured on the HTQ;
5. the comorbid diagnoses received by each group as measured on the HDRS, the HARS and by the special investigations;
6. the associated symptoms experienced by each group as measured on the HTQ.

The HTQ scores, the IES scores and the GAF scale results are presented in table 3.6 and then discussed.

Table 3.6 The PTSD score on the HTQ, the intrusive and avoidance scores on the IES and the GAF scale results of the acute PTSD group (N=33) compared with the scores of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Median				
HTQ PTSD score	2.3	1.1	<0.01 (MW)	1.00;1.25
Median				
HTQ Total score	2.0	1.1	<0.01 (MW)	0.76;1.00
Median				
Total IES score	44	2	<0.01 (MW)	33;43
Median				
Intrusive score	19	1	<0.01 (MW)	15;19
Median				
Avoidance score	25	0	<0.01 (MW)	20;24
Median GAF score	20	0	<0.01 (MW)	15;20

MW = Mann-Whitney Test

3.4.1 The severity of the PTSD as measured on the Harvard Trauma Questionnaire

Table 3.6 indicates that the median HTQ PTSD Score as well as the median HTQ Total Score of the acute PTSD group were significantly higher than those of the non-PTSD group ($p < 0.01$). The median HTQ PTSD Score (2.3) and the median HTQ Total score (2.0) of the acute PTSD group were slightly lower than the recommended HTQ PTSD symptomatic score of 2.5 (Mollica et al., 1992).

The fact that the HTQ has never been tested and validated on mine employees and Africans could have been one of the reasons for this lower than recommended score. Furthermore, the HTQ - a self-report questionnaire - was conducted in structured interview format. This may have had a researcher's effect on the scoring of responses. As the researcher adhered conservatively to the PTSD criteria. A third reason could have been the fact that the nature of the stressor of the research population differed from that of the HTQ population. The HTQ

population was primarily exposed to stressors of human design, whereas the research sample was primarily exposed to accidental stressors. The PTSD in individuals exposed to stressors of human design has been found to be more severe (APA, 1994; Ullman & Siegel, 1994; Ullman, 1995; WHO, 1992b).

3.4.2 The severity of the intrusive and avoidance symptoms as measured on the Impact of Event Scale

The avoidance and intrusive PTSD symptoms were measured on the IES (Horowitz et al., 1979). The results are presented in table 3.6. The median total score, median intrusive score and the median avoidance score on the Impact of Event Scale of the acute PTSD group were all significantly higher than those of the non-PTSD group ($p < 0.01$).

Although not shown in table 3.6 it was found that the median avoidance score (25) of the acute PTSD group was significantly higher than the median intrusive (19) score of the same acute PTSD group ($p < 0.01$; 95% confidence interval of 2 to 7). Stevens, Gagiano and Calitz (1996) also noted higher avoidance scores than intrusive scores in treatment-seeking mine employees with PTSD. However, literature has indicated that intrusive symptoms are usually more prominent in the acute phase of PTSD (Scrignar, 1988; Solomon, 1989).

These results support the assumption of Stevens, Gagiano and Calitz (1996) that avoidance symptoms in mine employees may already become more prominent during the acute phase due to the absence of a stable support network. The ongoing exposure to a dangerous mining environment, circumstances similar to those of the accident, may also trigger avoidance symptoms. Attitudes such as "the sooner I get out of this place the better" could have been facilitated. These mine employees had, however, already had many years of service and most of them were

responsible for the survival of an extended family. Simply to leave the mine freely could have been a difficult and emotional conflict-producing decision, one of the psycho-dynamics for the development of PTSD.

3.4.3 The deterioration of the general levels of functioning as measured on the General Assessment of Functioning Scale

Table 3.6 indicates that the median deterioration of functioning of the acute PTSD group (20) was significantly more ($p < 0.01$) severe compared with that of the non-PTSD group. In spite of this deterioration of functioning only 39% of the acute PTSD group did not return to work (table 3.2).

Green et al. (1993) indicated that return to work should not necessarily be interpreted as normal functioning since other areas of functioning may be affected. They found that most of the subjects with PTSD they had assessed returned to work (Green et al., 1993). The symptoms which affect level of functioning, namely, avoidance behaviour (McFarlane, 1993), diminished interest, social withdrawal and concentration problems (Green et al., 1993) were experienced by the majority of subjects in the acute PTSD group.

3.4.4 PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the DSM-IV cluster B, cluster C and cluster D PTSD symptoms, as measured on the HTQ of the acute PTSD group were compared to those of the non-PTSD group. The results are subsequently presented and discussed.

3.4.4.1 Cluster B: Re-experiencing symptoms

A comparison of the positive response rates and the severity of the PTSD re-experiencing symptoms of the acute PTSD group and the to non-PTSD group is presented in table 3.7 and then discussed.

Table 3.7 The re-experiencing symptoms of the acute PTSD group (N=33) compared with those of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Intrusive recollections				
little bit	18.2%	38.8%		
quite a bit	39.4%	14.0%		
extremely	33.3%	1.7%		
Total positives	91%	55%	<0.01 (Chi)	23.1%;49.6%
Distressing dreams				
little bit	21.2%	5.8%		
quite a bit	15.2%	-		
extremely	12.1%	-		
Total positives	49%	6%	<0.01 (Fis)	25.1%;60.3%
Reenactment				
little bit	24.2%	18.2%		
quite a bit	42.4%	6.6%		
extremely	21.2%	-		
Total positives	88%	25%	<0.01 (Chi)	49.6%;76.6%
Psychological distress				
little bit	36.4%	28.9%		
quite a bit	33.3%	5.8%		
extremely	30.3%	1.7%		
Total positives	100%	36%	<0.01 (Chi)	55.1%;72.2%
Physiological reactivity				
little bit	36.4%	28.9%		
quite a bit	33.3%	5.8%		
extremely	30.3%	1.7%		
Total positives	100%	36%	<0.01 (Chi)	55.1%;72.2%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.7 indicates that significantly more ($p < 0.01$) subjects in the acute PTSD group than those in to the non-PTSD group experienced **intrusive recollections**. Thirty-nine per cent of the acute PTSD group experienced the

intrusive recollections as "quite a bit" and 33.3% experienced it as "extremely". The majority of the acute PTSD group (72.7%) therefore experienced the intrusive recollection symptoms moderately to severely. Fifty-five per cent of the non-PTSD group experienced the intrusive recollection symptom. Only 14% experienced it as "quite a bit" and only 1.7% experienced it as "extremely".

Table 3.7 shows that **distressing dreams** about the traumatic event were experienced by significantly more ($p < 0.01$) subjects in the acute PTSD group than in the non-PTSD group. Twenty-seven per cent experienced them moderately ("quite a bit") to severely ("extreme").

Table 3.7 indicates that symptoms of **re-enactment** were experienced by significantly more ($p < 0.01$) subjects in the acute PTSD group than in the non-PTSD group. The majority of the acute PTSD group (63.6%) experienced the re-enactment symptoms moderately ("quite a bit") to severely (extreme). The majority of the non-PTSD group who experienced re-enactment symptoms (18.2%), experienced them to a minor degree ("little bit").

According to the results in table 3.7, all the subjects (100%) in the acute PTSD group reported **psychological distress** and **physical reactivity** when exposed to events that symbolized or resembled the traumatic event (see table 3.7). This was significantly more ($p < 0.01$) than in the non-PTSD group. The majority (63.6%) of the acute PTSD group reported moderate ("quite a bit") to severe ("extremely") levels of symptom intensity whereas only 7.5% the non-PTSD group experienced these symptoms moderately to severely.

Conflicting opinions exist about the predictive value of intrusive re-experiencing symptoms soon after the traumatic event and the onset of PTSD (McFarlane, 1988c; Baum, 1990). The results supported other reports that

intrusive recollections are commonly experienced soon after the traumatic event (Scrignar, 1988; Solomon, 1989). Even though many non-PTSD subjects experienced intrusive recollections they were still experienced significantly more by the acute PTSD group. Furthermore, it also seemed that the acute PTSD group could be differentiated from the non-PTSD group in terms of the level of severity of the symptom experience. These results therefore supported the findings of McFarlane (1988c) that intrusive thoughts had a low specificity and high sensitivity for PTSD. McFarlane (1988c) concluded that intrusive thoughts and feelings might not be specific enough as diagnostic criteria for PTSD.

In comparison with the other PTSD symptoms, nightmares were experienced markedly less often. These results support other findings that nightmares are not very prevalent in victims of disaster (Madakasira & O'Brien, 1987; Mollica et al., 1992).

The "symptoms of re-enactment" were very difficult to assess due to language restrictions. It was not always possible to determine whether positive responses represented true dissociative reactions. Roszell, McFall and Malas (1991) suggested that flashbacks represent true dissociative reactions. None the less, the reason for this high positive and high severity response rate may be related to the fact that the majority of the acute PTSD group returned to underground work after the accident. Exposure to conditions similar to the traumatic event could have increased arousal symptoms, and Mellman and Davis (1985) found that heightened arousal levels could precipitate flashbacks.

It was difficult to distinguish the psychological distress from the physiological reactivity symptoms during the assessment interviews. Subjects mostly interpreted these two items as similar. This may explain the similarity of the results for these two symptoms. The high prevalence of these symptoms in the

acute PTSD group supported findings of McFarlane (1988c) that affective recall is very specific (97%) and has a low sensitivity (33%) for PTSD. Shalev, Orr, & Pitman (1993) also showed elevated physiological response to be specific to PTSD.

3.4.4.2 Cluster C: Avoidance and numbing of general responsiveness

The positive response rates and the severity of the avoidance and numbing of general responsiveness symptoms of the acute PTSD group compared to those of the non-PTSD group are presented in table 3.8 and then discussed.

Table 3.8 The avoidance and numbing of general responsiveness symptoms of the acute PTSD group (N=33) compared with those of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Avoid thoughts/ feelings/ conversations				
little bit	12.1%	16.5%		
quite a bit	45.5%	11.6%		
extremely	39.4%	1.7%		
Total positives	97%	30%	<0.01 (Chi)	57.2%;77.2%
Avoid activities/ places/ people				
little bit	42.4%	14.0%		
quite a bit	36.4%	-		
extremely	18.2%	1.7%		
Total positives	97%	16%	<0.01 (Chi)	72.5%;90%
Inability to recall				
little bit	15.2%	2.5%		
quite a bit	18.2%	1.7%		
extremely	9.1%	0.8%		
Total positives	42%	5%	<0.01 (Fis)	20.2%;54.8%
Diminished interest/ participation				
little bit	21.2%	0.8%		
quite a bit	42.4%	0.8%		
extremely	9.1%	0.8%		
Total positives	73%	2.4%	<0.01 (Chi)	54.8%;85.7%
Detachment/ estrangement				
little bit	30.3%	2.5%		
quite a bit	24.2%	-		
extremely	9.1%	-		
Total positives	64%	3%	<0.01 (Chi)	44.5%;77.8%
Restricted affect				

little bit	39.4%	11.6%		
quite a bit	39.4%	3.3%		
extremely	21.2%	0.8%		
Total positives	100%	16%	<0.01 (Chi)	77.8%;90.8%
Foreshortened future				
little bit	36.4%	3.3%		
quite a bit	18.2%	1.7%		
extremely	24.2%	0.8%		
Total positives	79%	6%	<0.01 (Chi)	58.4%;87.6%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.8 indicates that "**avoidance of thoughts and/or feelings and/or conversations** about the traumatic event" were experienced significantly more ($p < 0.01$) by the acute PTSD group than by the non-PTSD group. The majority of the acute PTSD group experienced moderate ("quite a bit"; 45.5%) to severe ("extremely"; 39.4%) levels of cognitive avoidance symptoms. This symptom was experienced by 30% of the non-PTSD group while only 11.6% experienced it moderately and 1.7% severely.

Table 3.8 shows that "the **avoidance of activities, places or people** that might remind victims of the traumatic event" were experienced by almost all the acute PTSD subjects (97%), significantly more ($p < 0.01$) than by the non-PTSD group. Only 16% of the non-PTSD group experienced avoidance behaviour symptoms.

According to table 3.8, only 42% of the acute PTSD group experienced symptoms of **psychogenic amnesia** but this was significantly more ($p < 0.01$) than those experienced by the non-PTSD group (5%).

According to table 3.8, the symptoms of **diminished interest and/or participation in significant activities** were experienced significantly more ($p < 0.01$) by the acute PTSD group (73%) than by the non-PTSD group (2.4%).

Table 3.8 indicates that the majority (64%) of the acute PTSD group experienced symptoms of **estrangement and detachment**, which is significantly more ($p < 0.01$) than in the non-PTSD group (3%). Thirty-three percent of the acute PTSD group experienced them moderately ("quite a bit") to severely ("extreme") whereas 30% experienced them mildly ("little bit").

Table 3.8 shows that all the subjects (100%) in the acute PTSD group experienced symptoms of **restricted affect**, which is significantly more ($p < 0.01$) than in the non-PTSD group (16%). The majority (60.6%) of the acute PTSD group experienced this symptom moderately ("quite a bit"; 39.4%) to severely ("extremely"; 21.2%).

According to table 3.8, a **sense of foreshortened future** was experienced by 79% of the acute PTSD group, significantly ($p < 0.01$) more than that by the non-PTSD group (6%). It was experienced moderately to severely by 42.4% of these subjects.

The high prevalence of cognitive avoidance symptoms in the acute PTSD group could indicate that mine employees with acute PTSD might not seek help during the early stages of PTSD. McFarlane (1986) stated that one of the main problems in the diagnosis and treatment of PTSD is created by the tendency for patients to go to considerable lengths to remove their painful and intrusive thoughts from awareness. They may not offer any information about the traumatic event.

The acute PTSD group experienced avoidance behaviour symptoms less severely than they experienced cognitive avoidance symptoms. Avoidance behaviour symptoms were, however, the most severely experienced symptom in treatment-seeking mine employees (Stevens, Calitz & Gagiano, 1996). The lower severity of avoidance behaviour symptoms in the acute PTSD group may therefore be an indication of the severity and the course of the disorder. McFarlane (1988c) stated that victims

who do seek help may represent an atypical sub-sample of subjects with PTSD because avoidance behaviour may keep traumatized victims from seeking help. The increase of avoidance behaviour symptoms has been associated with chronic PTSD (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989) whereas this group represented subjects with acute PTSD.

Psychogenic amnesia was difficult to assess objectively because the researcher had to rely on the subjective reports of the subjects about the trauma. Their reports could not be verified objectively. According to Scrignar (1988), amnesia seems to protect people from the dysphoric emotional effects of the trauma. It may thus be possible that the amnesia symptoms could eventually be worse and more common than the reported results.

The big difference between the acute PTSD group and the non-PTSD group in terms of diminished interest and/or participation in significant activities supported reports by McFarlane (1988c) that reduced involvement is possibly specific but not sensitive to PTSD.

Symptoms of estrangement and detachment were very prevalent in the acute PTSD group but not experienced very severely. According to McFarlane (1988c) the quality and prevalence of estrangement and detachment symptoms may be influenced by the nature of the traumatic event. He found that feelings of estrangement were uncommon in a group of fire-fighters with PTSD. On the other hand, Orner (1993) found that symptoms of alienation differentiated PTSD victims from non-PTSD victims in stressors of human design. These results thus indicated that victims of earth-fall accidents, an accidental stressor, may be prone to develop symptoms of estrangement, though not very severely during the acute phase.

The subjects with acute PTSD were very liable to experience symptoms of restricted affect. This form of denial may have been a defence against the painful exposure to circumstances that continually reminded them of the traumatic event, because, most of the subjects returned to their underground working environment. Horowitz (1993) said that a person with numbing symptoms may actually feel surrounded by a layer of insulation. On the other hand, treatment-seeking employees with PTSD presented with less severe "restricted affect" symptoms (Stevens, Calitz, & Gagiano, 1996). Their help-seeking behaviour may have been the result of an inability to numb themselves against anxiety symptoms and phobic behavioural urges.

The subjects with acute PTSD were also liable to experience a sense of foreshortened future. These feelings were usually related to expectations that they might die underground due to mine accidents.

To conclude, Cluster C symptomatology was experienced significantly more by the acute PTSD group than by the non-PTSD group. The cluster C symptoms appeared sensitive and specific for subjects with acute PTSD.

3.4.4.3 Cluster D: Symptoms of increased arousal

The positive response rates and the severity of the symptoms of increased arousal of the acute PTSD group compared to those of the non-PTSD group, are presented in table 3.9 and then discussed.

Table 3.9 The symptoms of increased arousal of the acute PTSD group (N=33) compared with those of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus non-PTSD group
Difficult fall/stay asleep				
little bit	33.3%	4.1%		
quite a bit	33.3%	3.3%		
extremely	21.2%	0.8%		
Total positives	88%	8%	<0.01 (Chi)	67.4%;91.8%
Irritability/ anger outbursts				
little bit	24.2%	4.1%		
quite a bit	18.2%	0.8%		
extremely	6.1%	-		
Total positives	49%	5%	<0.01 (Fis)	26.0%;61.0%
Difficulty concentrating				
little bit	45.5%	5.0%		
quite a bit	24.2%	0.8%		
extremely	9.1%	-		
Total positives	79%	6%	<0.01 (Chi)	58.4%;87.6%
Hypervigilance				
little bit	39.4%	5.8%		
quite a bit	18.2%	0.8%		
extremely	6.1%	-		
Total positives	64%	7%	<0.01 (Chi)	40.0%;74.0%
Startle response				
little bit	9.1%	9.1%		
quite a bit	24.2%	0.8%		
extremely	9.1%	-		
Total positives	42%	10%	<0.01 (Chi)	14.8%;50.2%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.9 indicates that **sleeping problems** were experienced by 88% of the acute PTSD group, significantly more ($p < 0.01$) than those experienced by the non-PTSD group (8%). Symptoms of **irritability and/or anger outbursts** were experienced by 49% of the acute PTSD group, also significantly more ($p < 0.01$) than those experienced by the non-PTSD group (5%).

According to table 3.9, **concentration problems** were experienced by 79% of the acute PTSD group, significantly more ($p < 0.01$) than those experienced by the non-PTSD group (6%). Most of the acute PTSD subjects (45,5%) experienced them mildly

("little bit"). Symptoms of **hypervigilance** were also experienced significantly more ($p < 0.01$) by the acute PTSD group (64%) than by the non-PTSD group (7%). Thirty-nine per cent of the acute PTSD group experienced it mildly ("little bit"), whereas 18.2% experienced it moderately ("quite a bit") and 6.1% experienced it severely ("extremely"). A **startle response** was experienced by 42% of the acute PTSD group and this was also significantly more ($p < 0.01$) than that experienced by the non-PTSD group (10%).

The subjects with acute PTSD were liable to experience sleeping problems. Solomon (1991) indicated that problems with sleep in PTSD subjects could be due to their inability to stem intrusive thoughts about the traumatic event, or because of physiological arousal. The high percentage of intrusive thoughts (91%) and physiological reactivity symptoms (100%; see table 3.7) in the acute PTSD group supported these assumptions.

Symptoms of irritability and anger outbursts were not very severe in comparison with most of the other PTSD symptoms. During the assessment interviews the subjects often perceived this question as an insult. It often appeared that the subjects had difficulty in admitting to these symptoms. The question had to be carefully explained to the subjects to avoid the impression that they were being accused of being aggressive. The current South African climate of violence could have been one reason for this clinical impression. The other reason may be related to cultural values. It is thus possible that this symptom could have been under reported. On the other hand, this result may support other reports that irritability and anger outbursts are less prevalent in victims of technological and natural trauma (Weisaeth, 1989b; Weisaeth & Eitinger, 1993).

The high frequency of subjects in the acute PTSD group with concentration problems supported other reports that concentration problems may be central in

the PTSD phenomenology (McFarlane, 1988c, 1993; Weiss, 1993). The low severity could have been related to the acute course of the PTSD in the acute PTSD group. Stevens, Calitz and Gagiano (1996) found that all the treatment-seeking mine employees with PTSD had concentration problems.

Symptoms of hypervigilance were common in the acute PTSD subjects. Stevens, Calitz and Gagiano (1996) found similar results in treatment-seeking mine employees with PTSD. The low prevalence of the startle response in the acute PTSD subjects was assumed to be a function of the acute course of the syndrome. It might also have been a reflection of the type of stressor, because the subjects could have been comforted by the fact that the danger was merely situational, that is, "it only happens underground".

The results indicate that arousal symptoms were experienced significantly more by the acute PTSD group than by the non-PTSD group. The arousal symptoms appeared specific but not as sensitive for subjects with acute PTSD.

3.4.5 Comorbid diagnoses

The acute PTSD group and the non-PTSD group were compared in terms of the following comorbid syndromes:

1. general anxiety disorder as measured on the HARS;
2. major depressive disorder as measured on the HDRS;
3. alcohol abuse as assessed by the special investigations;
4. cannabis abuse as assessed by the special investigations.

The results are presented in table 3.10 and then discussed.

Table 3.10 Comorbid disorders in the acute PTSD group (N=33) as compared with those of to the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus the non-PTSD group
Complicated PTSD	55%	3%	<0.01 (Fis)	34.9%;69.3%
Median HARS score	15	1	<0.01 (MW)	8;15
Median psychic anxiety score	10	0	<0.01 (MW)	7;11
Median somatic anxiety score	3	0	<0.01 (MW)	0;3
Major anxiety	52%	7%	<0.01 (Chi)	27.3%;62.5%
Minor anxiety	39%	13%		8.4%;43.9%
Median HDRS score	12	0	<0.01 (MW)	9;13
Major depression	27%	3%	<0.01 (Chi)	9.4%;40.2%
Minor depression	27%	3%		9.4%;40.2%
Alcohol abuse	13%	14%	1.00 (MW)	-14.7%;13.0%
Cannabis abuse	19%	17%	0.86 (MW)	-14.2%;16.9%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

MW = Mann-Whitney Test

Table 3.10 indicates that 55% of the acute PTSD group (55%) had **complicated PTSD**, significantly more ($p < 0.01$; 95% confidence interval of 34.9% to 69.3%) than the non-PTSD group had (3%).

According to table 3.10, significantly more ($p < 0.01$) subjects in the acute PTSD group had **major depressive disorder** than subjects in the non-PTSD group. The HDRS score of the acute PTSD group (12) was also significantly higher ($p < 0.01$) than that of the non-PTSD group (0). The higher percentage of comorbid major depression in the acute PTSD supported the findings of Moore and Boehnlein (1991) that PTSD may increase the incidence and severity of depression.

Table 3.10 indicates that significantly more ($p < 0.01$) subjects in the acute PTSD group had **general anxiety disorder** than did the non-PTSD group. The median

psychological anxiety score and the median somatic anxiety score on the HARS were also both significantly higher ($p < 0.01$) in the acute PTSD group than in the non-PTSD group. The associated high comorbidity with generalized anxiety disorder reflected the anxious nature of the trauma syndrome in these subjects and supported literature that considered PTSD as an anxiety syndrome (APA, 1994; Foa et al., 1995).

Although not shown in table 3.10, the median psychological anxiety score (10) of the acute PTSD group was significantly higher ($p < 0.01$; 95% confidence interval of 5 to 9) than the median somatic anxiety score (3) of the same acute PTSD group. Various studies have indicated that physical symptoms are often a major focus of complaint and the main reason for people with chronic PTSD to consult their family doctors (de Loos, 1990; McFarlane, 1988c; Solomon, 1993). Somatic anxiety symptoms were therefore expected to be more pronounced. Stevens, Calitz and Gagiano (1996) found that treatment-seeking mine employees with PTSD mostly presented with somatic symptoms but experienced more psychic anxiety than somatic anxiety on the HARS. According to them, mine employees may perceive Western health as somatically orientated and therefore they may present their complaints somatically. This does not mean that mine employees are somatically orientated. They suggested that presentation with somatic symptoms be clarified (Stevens, Calitz and Gagiano; 1996). The results of this study therefore seem to support the findings of Stevens, Calitz and Gagiano (1996) that acute PTSD in mine employees may have a psychological anxiety quality rather than a somatic orientated quality.

Table 3.10 indicates that **substance abuse disorders** (alcohol and cannabis) were not common in either group and the groups did not differ significantly in terms of alcohol and cannabis abuse. This supported other reports that found substance abuse disorders to be uncommon in PTSD patients (Breslau et al., 1991; Rundell et

al., 1989). Lerer, Bleich, Kotler, Garb, Hertzberg, & Levin (1987) said that high prevalence rates of substance use disorders in certain PTSD populations are not a feature specific to PTSD but rather reflect trends relevant to the population. These low prevalence rates of substance abuse in both groups might also have reflected the selected nature of underground mineworkers. Stevens, Gagiano and Calitz (1996) also found that most treatment-seeking mine employees with PTSD were well-adjusted and responsible individuals.

To summarize, it was found that subjects with acute PTSD were at higher risk of having major depressive disorder and general anxiety disorder than subjects without PTSD. The results supported literature that considered PTSD as an anxiety syndrome. The quality of anxiety in these subjects was more psychological than somatically orientated. Substance abuse did not appear to be a complicating factor in subjects with acute PTSD.

3.4.6 Associated PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the associated PTSD symptoms, as measured on the HTQ of the acute PTSD group, compared to those of the non-PTSD, group are presented in table 3.11 and then discussed.

Table 3.11 The associated PTSD symptoms of the acute PTSD group (N=33) compared with those of the non-PTSD group (N=121).

	Acute PTSD group (N=33)	Non-PTSD group (N=121)	p-value	95% CI for difference acute PTSD group minus the non-PTSD group
Nobody understands				
little bit	15.2%	6.6%		
quite a bit	18.2%	1.7%		
extremely	6.1%	-		
Total positives	39%	8%	<0.01 (Fis)	13.8%;48.5%
Impairment function				
little bit	30.3%	12.4%		
quite a bit	54.5%	0.8%		
extremely	9.1%	0.8%		
Total positives	94%	14%	<0.01 (Chi)	69.7%;90.1%
Blaming self				
little bit	15.2%	6.6%		
quite a bit	18.2%	1.7%		
extremely	18.2%	-		
Total positives	52%	8%	<0.01 (Chi)	25.5%;61.0%
Blaming others				
little bit	3%	1.7%		
quite a bit	-	1.7%		
extremely	9%	-		
Total positives	12%	3%	0.07 (Fis)	-2.8%;20.4%
Survival guilt				
little bit	-	1.7%		
quite a bit	-	-		
extremely	3%	-		
Total positives	3%	2%	0.52 (Fis)	-4.9%;7.7%
Hopelessness				
little bit	21.2%	0.8%		
quite a bit	15.2%	0.8%		
extremely	15.2%	0.8%		
Total positives	52%	3%	<0.01 (Fis)	31.8%;66.3%
Ashamed				
little bit	24.2%	20.7%		
quite a bit	15.2%	6.6%		
extremely	39.4%	3.3%		
Total positives	79%	31%	<0.01 (Chi)	32.0%;64.4%
Thinking "why me?"				
little bit	21.2%	22.3%		
quite a bit	15.2%	3.3%		
extremely	42.4%	0.8%		
Total positives	79%	27%	<0.01 (Chi)	36.3%;68.4%
Thinking "only me"				
little bit	21.2%	4.1%		
quite a bit	12.1%	0.8%		
extremely	9.1%	0.8%		
Total positives	42%	6%	<0.01 (Fis)	19.3%;54.0%
Feel "going crazy"				
little bit	9.1%	0.8%		

quite a bit	9.1%	-		
extremely	6.1%	-		
Total positives	24%	1%	<0.01 (Fis)	8.7%;38.1%
Others are hostile				
little bit	6.1%	4.1%		
quite a bit	15.2%	2.5%		
extremely	-	-		
Total positives	21%	7%	0.02 (Fis)	-0.03%;29.2%
No one to rely on				
little bit	3%	4.1%		
quite a bit	3%	2.5%		
extremely	9%	0.8%		
Total positives	15%	7%	0.18 (Fis)	-5.4%;20.8%
Depersonalization				
little bit	9.1%	0.8%		
quite a bit	3.0%	-		
extremely	6.1%	-		
Total positives	18%	1%	<0.01 (Fis)	4.1%;30.6%
Feel betrayed				
little bit	3%	0.8%		
quite a bit	-	-		
extremely	-	-		
Total positives	3%	1%	0.38 (Fis)	-3.9%;8.3%
Ancestors' message				
little bit	18.2%	2.5%		
quite a bit	-	1.7%		
extremely	6.1%	1.7%		
Total positives	24%	6%	<0.01 (Fis)	3.3%;33.7%
Bewitched				
little bit	3.0%	5.8%		
quite a bit	6.1%	2.5%		
extremely	15.2%	-		
Total positives	24%	8%	0.03 (Fis)	0.6%;31.4%
Ignored rituals				
little bit	3%	0.8%		
quite a bit	3%	0.8%		
extremely	-	-		
Total positives	6%	2%	0.20 (Fis)	-4.0%;12.9%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 3.11 indicates that the feeling that "**nobody understands**" was experienced by 39% of the acute PTSD group, as opposed to 8% of ($p < 0.01$) the non-PTSD group. Assumptions "that no one understands" could have led to social withdrawal and isolation. They may have felt that the extended family would not have understood their fears and wishes to leave the mine for that would have left them without financial support.

Almost all the subjects in the acute PTSD group (94%) reported an **impairment of general functioning**, significantly more ($p < 0.01$) than the 14% of the non-PTSD group. The levels of impaired functioning were measured on the GAF scale and the results have been discussed (see 3.4.3 and table 3.7).

According to table 3.11, the "**blaming self**" symptom was experienced by 52% of the acute PTSD group, as opposed to 8% of ($p < 0.01$; 95% confidence interval of 25.5% to 61%) the non-PTSD group. These subjects usually blamed themselves for not being able to prevent the incident and often asked why they had ever come to work in the mines. "If I did not come to the mines the accident would not have happened" was a common statement. Janoff-Bulman (1995) termed these forms of self-blame as behavioural self-blame (see 3.5.2).

Survival guilt was only experienced by 3% of the acute PTSD group and by 2% of the non-PTSD group. This question was met by surprise by most of the subjects. They could not understand why the question was asked. Due to the continual exposure to danger of underground work "survival at all costs" could have become a principle of life and thereby vulnerability to survival guilt could have been reduced. The clinical impression was that subjects did not feel guilty, but rather wondered when it would be their turn to be injured. They had a perception of "my luck is running out" because most of them had been involved in one or more previous accidents (see table 3.2). Solomon (1993) also found that veterans were often annoyed by the question because they felt that the interviewer doubted their integrity. The low prevalence of survival guilt could also have been related to the nature of the mine accidents. According to Weisaeth and Eitinger (1993), guilt is less common in survivors of natural disasters and it becomes more severe as the trauma becomes more "man-made".

Table 3.11 shows that **hopelessness** was experienced by 52% of the subjects in the acute PTSD group, as opposed to 3% of ($p < 0.01$) the non-PTSD group. The conflict between leaving the mines with resultant financial hardship and remaining at the mines with subsequent anxiety could have caused these feelings of hopelessness.

According to table 3.11 the symptom "**feeling ashamed about what happened to you (ashamed)**" was experienced by 79% of the acute PTSD group, significantly more ($p < 0.01$) than the 31% of the non-PTSD group. The content of the shame feelings related feelings of inadequacy for not being able to prevent the incident and also for being unable to foresee the danger. The shame may thus have had elements of self-blame for example "I should have been aware and alert". This reflects the priority given to safety drills by the mines. It becomes a shame if an accident occurs in an employee's workplace. All mine accidents are followed by legal inquiries. These tribunals investigate human negligence and may thus instil a feeling of "I am guilty until proven not guilty". Stevens, Calitz and Gagiano (1996) also found that treatment-seeking mine employees with PTSD experienced shame about what happened to them. The feelings of inadequacy in the acute PTSD group differed from the shame content of personal weakness found in soldiers (Solomon, 1993) and humiliation found in rape victims (Notman & Nadelson, 1976).

Table 3.11 indicates that the symptom "**spending time thinking about why the events happened to you (why me?)**" was experienced by 79% of the acute PTSD group, significantly more ($p < 0.01$) than the 27% of the non-PTSD group. According to Scurfield (1993), survivors attempt to make some sense out of the event by asking the inevitable question as to why the event happened. In so doing the victim attempts to assimilate the new data related to the trauma into his or her assumptive world (Horowitz, 1993; Janoff-Bulman, 1995; Roth & Newman, 1995). The high prevalence of this "why me?" symptom in the acute PTSD group probably

reflected an inability to integrate the traumatic experience into their assumptive worlds with the subsequent development of PTSD.

Table 3.11 shows that the symptom "**you are the only one who suffered these events (only me)**" was experienced by 42% of the acute PTSD group, as opposed to 6% of ($p < 0.01$) the non-PTSD group. When victims of trauma can no longer rely upon their assumptive worlds to account for the data of their experience the stability of their conceptual system is threatened. The individuals are then thrown into states of psychological crisis (Janoff-Bulman, 1995). Schemata characteristic to PTSD sufferers may begin to develop, for example "why only me?". The victims generally experience a marked decrease in their sense of self-worth and may perceive themselves as being singled out for misfortune with exaggerated feelings of powerlessness and helplessness. This eventually leads to a loss of self-respect (Janoff-Bulman, 1995; Roth & Newman, 1995; Solomon, 1993).

According to table 3.11 the symptom "**I feel I am going crazy**" was experienced by 24% of the acute PTSD group, as opposed to 1% of ($p < 0.01$) the non-PTSD group. It is possible that this symptom may have indicated a severe degree of helplessness and anxiety.

Table 3.11 indicates that 21% of the acute PTSD group experienced "**others to be hostile**", which was significantly more ($p = 0.02$) than the 7% of the non-PTSD group. Symptoms with paranoiac content such as this one are not often experienced in victims of accidental and natural trauma (Baum, 1987), which could explain the low prevalence of this symptom in the acute PTSD group.

Table 3.11 shows that 18% of the acute PTSD group experienced **depersonalization** as opposed to 1% of ($p < 0.01$) the non-PTSD group. Both the DSM-III-R (APA, 1987) and the DSM-IV (1994) state that dissociative states are rare in PTSD, which

could explain the low prevalence of this symptom in these groups.

Depersonalization was difficult to measure, primarily owing to the difficulty in translating the question. Mollica et al. (1991) also had problems to translate this question in Indo-chinese populations where dissociative symptoms were found to be insignificant.

According to table 3.11, 24% of the acute PTSD group perceived the accident as an **ancestral message** to leave the mine. Beliefs that the accident was proof of being **bewitched** was also experienced by 24% of the acute PTSD group. These culturally related symptoms were both experienced significantly more by the acute PTSD group ($p < 0.01$ and $p = 0.03$) than by the non-PTSD group. In both groups only a few subjects (6% and 2%) thought that the accidents were punishments by their ancestors for **ignoring the cultural rituals**. In the case of these mine employees, culturally related symptoms might have served to provide a conflict-free exit from the dilemma between leaving or not leaving the mine, by providing acceptable culturally related reasons (Stevens, Calitz, & Gagiano, 1996). Literature indicates that belief in witchcraft and omens allows the conviction that traumatic events are predictable and therefore perhaps controllable (Straker & Moosa, 1988).

These results indicate that subjects with acute PTSD were liable to develop other associated symptoms. These associated symptoms were, however, less prevalent when compared to PTSD symptoms. This may emphasize the higher validity of the PTSD symptoms in identifying victims of trauma with PTSD. The subjects with acute PTSD were also more liable to experience culturally related symptoms. However, culturally related symptoms were not common, which possibly indicates a process of acculturation. The results seem to indicate that mine employees with acute PTSD have less paranoiac related symptoms and distrust in human beings.

This may therefore cause mine employees with acute PTSD to recover sooner and have a better prognosis once removed from the threatening environment.

3.5 Summary

The comparative results of the acute PTSD group and to the non-PTSD group are summarized as follows:

Pathogenesis

Modulating factors: Subjects who were not married, had less mining experience and were in the young adulthood life-stage, were non-Sothos, were first born males and were employed as mining assistants, were more vulnerable to develop acute PTSD. Subjects with a better education appeared more vulnerable to develop acute PTSD.

Stress factors: A history of exposure to traumatic events, the severity of the precipitating earth-fall, being injured, the severity of premorbid enduring stressors and the exposure to other premorbid stressors, increased the risk of victims to develop acute PTSD. The intensity of the traumatic event was a better predictor for acute PTSD than the number of previous traumas experienced.

Predisposing factors: A family history of psychiatric disease predisposed subjects to develop acute PTSD. A personal psychiatric history and, more specifically, a history of previous PTSD and major depressive disorders rendered subjects more vulnerable to develop acute PTSD.

Symptoms and signs: The primary acute PTSD group compared to the new acute PTSD group

DSM-IV PTSD symptoms: The symptoms of the subjects with reactivated PTSD were more severe than those of the new acute PTSD group. The PTSD distressing dreams and symptoms of estrangement and detachment were the only symptoms that significantly differentiated primary/reactivated PTSD subjects from new PTSD subjects.

Comorbid disorders: The subjects with primary PTSD appeared more vulnerable to comorbid generalized anxiety and major depressive disorder than subjects who developed PTSD for the first time.

Associated symptoms: The primary acute PTSD group did not differ significantly from the new acute PTSD group in terms of associated symptoms.

The small sizes of these two groups are viewed as a factor that influenced the significance of these results.

Symptoms and signs: The acute PTSD group compared to the non-PTSD group

DSM-IV PTSD symptoms: The avoidance symptomatology was more prevalent than the intrusive symptoms in the subjects with acute PTSD. It seemed possible that the absence of a social support network as well as the continual exposure to a dangerous working environment could have contributed to this phenomenon. All subjects with acute PTSD experienced significant deterioration of functioning. The majority however, still continued to work.

The cluster B, cluster C and cluster D PTSD symptoms were experienced significantly more by the acute PTSD group than by the non-PTSD group. Intrusive re-experiencing symptoms did not seem very specific but appeared sensitive to PTSD. The avoidance of thoughts, feelings and/or conversations about the traumatic event were very prevalent in the subjects with acute PTSD. This may predict a low help-seeking rate in mine employees with acute PTSD due to earth-fall mine accidents. Symptoms of hypervigilance and startle were less prevalent in subjects with acute PTSD, although still significantly more than in the non-PTSD subjects.

Comorbid disorders: Subjects with acute PTSD were significantly more vulnerable to develop major depressive disorder and general anxiety disorder than the non-PTSD group were. The results supported literature that considered PTSD as an anxiety syndrome. The quality of anxiety in these subjects was more psychological than somatically orientated. Substance abuse did not appear to be a complicating factor in subjects with acute PTSD.

Associated symptoms: Subjects with acute PTSD were more vulnerable to develop other associated symptoms. However, these associated symptoms were less prevalent than PTSD symptoms. This may therefore support the diagnostic criteria of PTSD in the DSM-IV (APA, 1994). Subjects with acute PTSD were also more vulnerable to experience cultural related symptoms. Culturally related symptoms were, however, not common, which possibly indicates a process of acculturation.

Subjects in the acute PTSD group whose symptoms became chronic (acute PTSD chronic group) are subsequently compared to subjects in the acute PTSD group whose symptoms remitted (the acute PTSD in-remission group).

4. THE ACUTE PTSD CHRONIC GROUP (N=12) COMPARED TO THE ACUTE PTSD IN-REMISSION GROUP (N=18).

The acute PTSD in-remission group (N=18) and the acute PTSD chronic group (N=12) were compared in terms of the modulating factors, pathogenic factors, and symptoms and signs. The composition of these two groups was described in chapter 7, section 9.

These two groups were compared in terms of the data received during the first assessment session. The aim was to identify the factors that differentiated the two groups one month after the traumatic event. The small sizes of the two groups must unfortunately be regarded as a factor that affected the interpretation of the results. The results are subsequently presented and discussed.

4.1 Modulating factors

The modulating factors were assessed on the Biographic questionnaire (see chapter 7, paragraph 6.1.1). The results of the acute PTSD chronic group and acute PTSD in-remission group are compared and presented in table 4.1 and then discussed.

Table 4.1 Modulating features of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18).

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
median age	37.5 yrs	38.5 yrs	0.97 (MW)	-6;6
Married	12 100%	16 89%		
Not married	- -	2 11%	0.50 (Fis)	-3.4%;25.6%
Sotho	7 58%	9 50%	1.00 (Fis)	
Extended family	5 42%	13 72%	0.14 (Fis)	-4.2%;65.3%
Support extended family	7 58%	17 94%	0.03 (Fis)	6.3%;65.9%
Education > st.6	3 25%	4 22%	1.00 (Fis)	-28.4%;33.9%
Eldest male child	8 67%	14 78%	0.68 (Fis)	-21.8%;44.0%
Median years mining	14.5 yrs	18 yrs	0.64 (MW)	-6;7
Hostel accommodation	11 92%	17 94%	1.00 (Fis)	-16.1%;21.7%
Home in rural areas	12 100%	17 94%	1.00 (Fis)	-16.1%;5.0%
Occupation:				
Team leader	2 17%	4 22%	0.79 (Fis)	-34.1%;23.0%
Mining assistant	6 50%	10 56%	0.79 (Fis)	-42.0%;30.9%
Machine operator	4 33%	4 22%	0.79 (Fis)	-21.8%;44.0%

MW = Mann-Whitney Test

Fis = Fisher's Exact Test

Table 4.1 indicates that only 42% (5) of the subjects in the acute PTSD chronic group lived in an **extended family** arrangement, whereas more subjects (72%) in the acute PTSD in-remission group tended to live in an extended family setup (95% confidence interval of -4.2% to 65.3%). Seventy-eight per cent of the acute PTSD in-remission group **supported the extended family** financially, as opposed to 58% of (p=0.03; 95% confidence interval of 6.3% to 65.9%) the acute PTSD chronic group.

Table 4.1 indicates that the acute PTSD chronic group and acute PTSD in-remission group did not differ significantly in terms of age, marital status, cultural denomination (for example Sotho), education, mining experience, hostel accommodation, permanent home and occupation.

Subjects with acute PTSD who lived in an extended family arrangement thus seemed less likely to have developed chronic PTSD. Subjects that were from an extended family possibly experienced more support from relatives than those who had a nucleus family arrangement. Since most of them lived in the mine hostels it might rather have been a perception of social support. According to Scott and Stradling (1992) perceptions of support can cushion the effects of a stressor. These results supported other studies that emphasize the important role of social support in the recovery process of individuals with PTSD (Figley, 1995; Solomon, 1993).

Subjects with acute PTSD who supported an extended family were less likely to have developed chronic PTSD. It was possible that support of an extended family could have had a motivating function, which could have improved the resistance of subjects against developing PTSD. The added responsibility of supporting the extended family could have created internal motivation to overcome fears and to continue to work for the sake of the whole family. Subjects who did not support an extended family could have experienced less purpose and drive to resolve their PTSD related emotional conflicts with subsequent higher levels of anxiety. In fact, Stevens, Calitz and Gagiano (1996) found that mine employees with PTSD experienced guilt feelings about leaving the mines because of their financial responsibility to the extended family. Furthermore, subjects who did not support an extended family might have been in a process of acculturation that could have left them socially isolated and more vulnerable to chronic PTSD. Various authors (Escobar et al., 1983; Kinzie & Fleck, 1987) indicated that a process of acculturation could result in feelings of insecurity which may exacerbate PTSD symptoms.

Stevens, Calitz and Gagiano (1996) found that treatment-seeking mine employees with PTSD experienced their responsibility to support the extended family

financially as the core of most of the underlying psychodynamic themes of their pathology. These subjects were confronted by two alternatives which created secondary guilt feelings and impasse: they either had to make i) the decision to leave the mine and be responsible for the resulting financial consequences this would have on the family, or ii) return to underground work and "risk their lives" again with the same financial consequences if they should die. As was previously (see 3.1) said, the African value system rejects humanistic self-centered lifestyles. Therefore making decisions to the detriment of and without consulting the group in favour of egocentric needs creates conflict and anxiety.

To conclude, it appeared that the perception of social support via the extended family, and adhering to cultural values (for example, to contribute to the financial wellbeing of the extended family) could have improved resistance of subjects with acute PTSD against developing chronic PTSD.

4.2 Stress factors

The acute PTSD chronic group was compared to the acute PTSD in-remission group in terms of exposure to stress factors. The role of the stress factors in the development of chronic PTSD was assessed as follows:

1. the influence of previous exposure to trauma as measured on the Mine Stress Factor Questionnaire;
2. the nature of the precipitating earth-fall accidents as measured on the Mine Stress Factor Questionnaire;
3. the injury severity as measured on the AIS-90 Abbreviated Injury Scale;
4. the nature of other stressors as measured on the Holmes-Rahe Stress Scale;
5. the severity of the acute and enduring stressors as measured on the Severity of Psycho-social Stressor Scale.

The results are summarized in table 4.2 and then discussed.

Table 4.2 The stress factors of the acute PTSD chronic group (N=12) compared with those of acute PTSD in-remission group (N=18).

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
History of previous traumas experienced, and/or witnessed, and/or heard of:				
At least 1 event	12 100%	13 72%	0.07 (Fis)	7.1%;48.5%
At least 2 events	10 83%	10 56%	0.24 (Fis)	-3.4%;58.9%
At least 3 events	5 42%	5 28%	0.46 (Fis)	-20.8%;48.6%
Acute stressor				
Only catastrophic	11 92%	16 89%	1.00 (Fis)	-18.6%;24.1%
Nature of earth-fall accident:				
Life in danger				
Experience	11 92%	18 100%	0.40 (Fis)	-24.0%;7.3%
Witness	-	-		
Colleague injured				
Experience	3 25%	3 17%	0.47 (Fis)	-21.6%;38.3%
Witness	1 8%	-		
Pinned by rocks				
Experience	8 67%	4 22%	0.06 (Fis)	11.6%;77.3%
Witness	1 8%	3 17%		
Trapped				
Experience	-	-		
Witness	-	-		
Alone during accident				
Experience	1 8%	1 6%	1.00 (Fis)	-16.1%;21.7%
Witness	-	-		
Unexpected				
Experience	12 100%	17 94%	1.00 (Fis)	-5.0%;16.1%
Witness	-	-		
No ventilation				
Experience	5 42%	4 22%	0.42 (Fis)	-14.4%;53.3%
Witness	-	-		

No light						
Experience	8	67%	5	28%	0.04 (Chi)	5.1%;72.6%
Witness	-	-	-	-		
Rescue assistance						
Experience	1	8%	2	11%		
Witness	6	50%	6	33%	0.75 (Fis)	-19.0%;52.4%
Desert accident scene immediately						
Experience	1	8%	1	6%	0.62 (Fis)	-16.1%;21.7%
Witness	2	17%	1	6%		
Injury						
Experience	10	83%	14	78%	1.00 (Fis)	-23.0%;34.1%
Witness	-	-	-	-		
Suffocation						
Experience	6	50%	2	11%	0.03 (Fis)	7.1%;70.7%
Witness	-	-	-	-		
Knock on head						
Experience	5	42%	3	17%	0.21 (Fis)	-7.8%;57.8%
Witness	-	-	-	-		
Unconscious						
Experience	5	42%	4	22%	0.53 (Fis)	-14.4%;53.3%
Witness	-	-	1	6%		
Thought it would happen						
Experience	2	17%	6	33%	0.42 (Fis)	-47.0%;13.6%
Witness	-	-	-	-		
Horror						
Experience	11	92%	16	89%	1.00 (Fis)	-18.6%;24.1%
Witness	-	-	-	-		
Intense fear						
Experience	12	100%	18	100%		
Witness	-	-	-	-		
Helplessness						
Experience	10	83%	18	100%	0.15 (Fis)	-37.8%;4.4%
Witness	-	-	-	-		
Hear colleagues cry						
Experience	5	42%	2	11%	0.08 (Fis)	-0.9%;62.0%
Witness	-	-	-	-		
Not return work						
Experience	6	50%	12	67%		
Witness	6	50%	6	33%	0.46 (Fis)	-19.0%;52.4%
Severity of injury:						
No injury	2	17%	4	22%	1.00 (Fis)	-34.1%;23%
Minor/moderate	6	50%	9	50%	1.00 (Fis)	-36.5%;36.5%
Severe/life threat	4	33%	5	28%	1.00 (Fis)	-28.2%;39.3%
Enduring stressors:						
Extreme level	4	33%	1	6%	0.13 (Fis)	-0.92%;56.5%
Other Stressors:						
Death of spouse	-	-	-	-		
Divorce/Separation	-	-	-	-		
Death in family	6	50%	7	39%	0.55 (Chi)	-25.0%;47.3%
Marriage	1	8%	2	11%	1.00 (Fis)	-24.1%;18.6%
Illness in family	3	25%	5	28%	1.00 (Fis)	-34.8%;29.3%
Sexual problems	3	25%	-	-	0.05 (Fis)	0.5%;49.5%
New born baby	1	8%	1	6%	1.00 (Fis)	-16.1%;21.7%
Death of friend	3	25%	-	-	0.05 (Fis)	0.5%;49.5%
Change of work	1	8%	1	6%	1.00 (Fis)	-16.1%;21.7%

Problems in-laws	-	-	3	17%	0.26 (Fis)	-33.9%;0.5%
Supervisor problem	1	8%	3	17%	0.63 (Fis)	-31.6%;14.9%
Change work hours	1	8%	-	-	0.40 (Fis)	-7.3%;24.0%
See family only weekends						
or on holidays	10	83%	16	89%	1.00 (Fis)	-31.2%;20.0%
Less than month ago						
on leave	-	-	2	11%	0.50 (Fis)	-25.6%;3.4%
More than 6 months						
ago on leave	8	67%	11	61%	1.00 (Fis)	-29.4%;40.5%
Leave due within						
3 weeks	4	33%	3	17%	0.39 (Fis)	-15.1%;48.4%
Miscellaneous	4	33%	3	17%	0.39 (Fis)	-15.1%;48.4%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

4.2.1 Trauma history as assessed on the Mine Stress Factor Questionnaire

The responses of the subjects in terms of exposure to previous traumatic events were scored in exactly the same way as was described in section 3.2.

Table 4.2 indicates that all the subjects (100%) in the acute PTSD chronic group experienced **at least one previous traumatic event**, significantly more (95% confidence interval of 7.1% to 48.5%) than the 72% of the acute PTSD in-remission group. These results supported the stress vulnerability perspective (Selye, 1976) which claims that people who were involved in more than one traumatic event are more likely to develop chronic PTSD. Sporadic recurrent events tend to delay recovery from PTSD (Kardiner, 1941; Solomon, 1990; Sorenson & Golding, 1990; Williams, 1993).

Table 4.2 indicates that the acute PTSD chronic group did not differ from the acute PTSD in-remission group in terms of "**at least two or more previous traumatic events experienced**". This supported the stress inoculation perspective (Epstein, cited in Solomon, 1990, p.117) and/or the stress resolution perspective (Block & Zautra, 1981; Solomon, 1990). That is, subjects who did not develop chronic PTSD after at least two traumatic events may have resolved the effects of the trauma. Victims of trauma who are able to resolve the effects of traumatic

events are, according to Solomon (1990), more capable of resolving later trauma (stress resolution perspective). Epstein states (cited in Solomon, 1990, p.117) that individuals who are repeatedly exposed to traumatic events may eventually become immune to the effects of trauma (stress inoculation perspective).

4.2.2 Severity of the earth-fall accidents as measured on the Severity of Psycho Social Stressor Scale

Table 4.2 indicates that the severity of the earth-fall accident (**acute stressor**) was catastrophic for 92% of the acute PTSD chronic group and 89% of the acute PTSD in-remission group. These groups therefore did not differ significantly in terms of the severity of the earth-fall accidents.

4.2.3 Nature of the earth-fall accidents as assessed on the Mine Stress Factor Questionnaire

The most significant circumstances during the earth-fall accidents as indicated in table 4.2 are subsequently discussed.

Being "**pinned by rocks**" was experienced by 67% of subjects in the acute PTSD chronic group, significantly more (95% confidence interval of 11.6% to 77%) than the 22% of the acute PTSD in-remission group.

"**Absence of light**" was experienced by 67% of subjects in the acute PTSD chronic group, as opposed to 28% of (p=0.04; 95% confidence interval of 5.1% to 72.6%) the subjects in the acute PTSD in-remission group.

"**Suffocation**" was experienced by 50% of the acute PTSD chronic group, also significantly more ($p=0.03$; 95% confidence interval of 7.1% to 70.7%) than the 11% of the subjects in the acute PTSD in-remission group.

To "**hear colleagues cry**" during the earth-fall experience was experienced by 42% of the subjects in the acute PTSD chronic group, slightly more (95% confidence interval of -0.9% to 62.0%) than the 11% of the acute PTSD in-remission group. Subjects who heard colleagues cry, moan and/or call for help therefore seemed more likely to have developed chronic PTSD. This might have triggered feelings of helplessness and horror.

These results indicated that subjects who developed chronic PTSD were exposed to more severe events than those whose symptoms went into remission. For example, subjects that had been pinned by rocks were more vulnerable to chronic PTSD. Being pinned by rocks with consequent sensations of suffocation and darkness might have intensified the levels of stress experience of the subjects. It involved virtually all the senses, for example, feeling the rocks on top of you, smelling and tasting the dust, seeing darkness, hearing the cries of colleagues and the sounds of falling rocks. The results supported the statements of Scrignar (1988) that emphasized that the more senses that were affected by a traumatic event, the higher the risk for symptom development. Various studies have indicated that as the intensity of exposure to the disaster increased, the number of victims who developed PTSD increased progressively as well (Baum, 1987; Desivilya et al., 1996; Gleser et al., 1981; Shore et al., 1986; Weisaeth & Eitinger, 1993).

4.2.4 Injury severity as measured on the AIS-90 Abbreviated Injury Scale

Table 4.2 indicates that the acute PTSD chronic group did not differ significantly from the acute PTSD in-remission group in terms of the severity of injuries. It was concluded that injury severity did not play an important role in predisposing subjects with acute PTSD to develop chronic PTSD.

Green et al. (1993) also did not find a direct relationship between the physical outcomes of subjects and PTSD at one month and at 18 months after the incident. McFarlane et al. (1994) speculated that vulnerability factors play a greater role than injury severity in PTSD symptom development. However, in this study injury severity did seem to predispose subjects to develop acute PTSD (see 3.2), but not chronic PTSD.

4.2.5 Severity of the enduring stressors as measured on the Severity of Psychosocial Stressor Scale

Table 4.2 indicates that extreme levels of **enduring stressors** were experienced by 33% of the acute PTSD chronic group, slightly more (95% confidence rate of - 0.92% to 56.5%) than the 6% of the acute PTSD in-remission group. Extreme levels of enduring stress therefore not only seemed to have predisposed the subjects to develop acute PTSD (see 3.2), but also to chronic PTSD.

4.2.6 Other stressors as assessed on the Holmes-Rahe Stress Scale

The results in table 4.2 indicate that only **death of a friend** and **sexual problems** were experienced significantly more by the acute PTSD chronic group than by the the acute PTSD in-remission group.

Twenty-five per cent of the acute PTSD chronic group were exposed to the death of a friend, as opposed to none ($p=0.05$; 95% confidence interval of 0.5% to 49.5%) in the acute PTSD in-remission group.

Sexual problems were experienced by 25% of the acute PTSD chronic group, as opposed to none ($p=0.05$; 95% confidence interval of 0.5% to 49.5%) in the acute PTSD in-remission group.

Leave factors associated with migrant occupations were also assessed, for example the timings of the leave periods of mineworkers. No significant results were found in this regard. It may thus be assumed, also considering the results presented at 3.2, that timing of leave does not play a significant role in the onset or course of PTSD in mine employees exposed to earth-fall accidents.

The minority of both the acute PTSD chronic group and acute PTSD in-remission group experienced **other stressors**. It therefore seemed that other stressors had a limited effect on the development of chronic PTSD. Generally these results indicated however, that more subjects in the acute PTSD chronic group experienced other stressors than subjects in the acute PTSD in-remission group. Although the two groups under discussion were very small, the results supported literature which states that exposure to enduring stress factors increases the vulnerability of people developing chronic PTSD (APA, 1994; Scrignar, 1988).

To summarize, it was found that a history of previous trauma exposure, the severity of the precipitating traumatic events, the severity of enduring stressors, and the exposure to other stressors increased the vulnerability of subjects with acute PTSD to develop chronic PTSD.

4.3 Predisposing factors

The family history of psychiatric syndromes and the personal history of psychiatric problems of the acute PTSD chronic group were compared to the same phenomena of the acute PTSD in-remission group. A family history of psychiatric disorders was assessed on the Genetic Classification Questionnaire. A personal history of psychiatric problems was evaluated on the Primary and Secondary Nosology Classification Questionnaire. The results are summarized in table 4.3 and then discussed.

Table 4.3 Family and personal history of psychiatric disorders in the acute PTSD chronic group (N=12) compared with that of the acute PTSD in-remission group (N=18).

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Family history:				
PTSD spectrum	4 33%	10 56%	0.23 (Chi)	-13.0%;57.4%
Psychiatric history:				
Primary PTSD	4 33%	8 44%	0.71 (Fis)	-24.1%;46.3%
Secondary PTSD	5 42%	6 33%	0.71 (Fis)	-43.7%;27.1 %
Alcohol primary	- -	3 17%	0.26 (Chi)	-0.6%;33.9%
Cannabis primary	2 17%	1 6%	0.55 (Chi)	-34.7%;12.5%
Phobia primary	1 8%	1 6%	1.00 (Chi)	-21.7%;16.1%
Anxiety primary	- -	2 11%	0.50 (Chi)	-3.4%;25.6%
Somatoform prim	1 8%	- -	0.40 (Chi)	-24.0%;7.3%
Depression prim	2 17%	4 22%	1.00 (Chi)	-23.0%;34.1%

Chi = Chi-squared Test

Fis = Fisher's Exact Test

4.3.1 Family history as assessed on the Genetic Classification Questionnaire

Table 4.3 indicates that four subjects (33%) in the acute PTSD chronic group and 10 (56%) in the acute PTSD in-remission group had a family history of a psychiatric disorder. The differences between these two groups were not significant ($p=0.23$).

4.3.2 Psychiatric history as assessed on the Primary and Secondary Nosology Classification Questionnaire

Table 4.3 indicates no significant differences between the acute PTSD chronic group and the acute PTSD in-remission group in terms of a history of previous PTSD or any other psychiatric syndrome.

To summarize, these results did not support hypotheses that a family history or a history of personal psychiatric problems may predispose subjects with an acute PTSD to develop chronic PTSD. The absence of significant results could have been due to the small sizes of the acute PTSD chronic group and the acute PTSD in-remission group.

4.4 Symptoms and signs

The symptom manifestations of the acute PTSD chronic group ($N=12$) were compared with those of the acute PTSD in-remission group ($N=13$) and are presented and discussed in the following order:

1. the severity of the PTSD as measured on the HTQ;
2. the severity of the intrusive and avoidance symptoms as measured on the IES;
3. the deterioration of the general levels of functioning as measured on the GAF scale;

4. the severity of the different DSM-IV PTSD symptoms and the positive response rate received by each symptom as measured on the HTQ;
5. the comorbid diagnoses received by each group as measured on the HDRS, the HARS and by the special investigations;
6. the associated symptoms experienced by each group as measured on the HTQ are finally presented and discussed.

4.4.1 The severity of the PTSD as measured on the Harvard Trauma Questionnaire

The HTQ scores, the IES scores and the GAF scale results subsequently presented in table 4.4 and then discussed.

Table 4.4 The HTQ scores, the IES scores and the GAF scale results of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18).

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value*	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Median HTQ PTSD score	2.3	2.3	0.92	-0.5;0.31
Median HTQ Total score	2.1	2.0	0.93	-0.33;0.33
Median Total IES score	43	44	0.89	-9;10
Median Intrusive	18.5	19.5	0.85	-6;6
Median Avoidance	23.5	25.5	0.87	-5;5
Median GAF score	20	20	0.97	-5;5

* = Mann-Whitney Test

Table 4.4 indicates that the PTSD score and the total PTSD score of acute PTSD chronic group on the HTQ did not differ significantly from the scores of the acute PTSD chronic group.

4.4.2 The severity of the intrusive and avoidance symptoms as measured on the Impact of Event Scale

Table 4.4 indicates that the IES scores, the intrusive and avoidance scores of the acute PTSD chronic group on the IES did not differ significantly from those of the acute PTSD chronic group. The avoidance scores of both groups were higher than the respective intrusive scores. The possible reasons for this difference have been discussed (see 3.4.2).

4.4.3 The deterioration of the general levels of functioning as measured on the General Assessment of Functioning Scale

Table 4.4 indicates that the acute PTSD chronic group and the acute PTSD in-remission group experienced significant deterioration of general levels of functioning. The difference between the two groups was not significant.

4.4.4 PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the DSM-IV cluster B, cluster C and cluster D PTSD symptoms, as measured on the HTQ, of the acute PTSD chronic group were compared to those of the acute PTSD in-remission group. The results are subsequently presented and discussed.

4.4.4.1 Cluster B: Re-experiencing symptoms

The positive response rates and the severity of the re-experiencing PTSD symptoms of the acute PTSD chronic group compared to those of the acute PTSD in-remission group are presented in table 4.5. and then discussed.

Table 4.5 The re-experiencing symptoms of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the first assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group and Acute PTSD in-remission group
Intrusive recollections				
little bit	-	5 28%		
quite a bit	5 42%	7 39%		
extremely	6 50%	5 28%		
Total positives	11 92%	17 95%	1.00 (Fis)	-24.9%;16.3%
Distressing dreams				
little bit	1 8%	5 28%		
quite a bit	2 17%	3 17%		
extremely	2 17%	1 6%		
Total positives	5 42%	9 50%	0.65 (Chi)	-41.2%;26.9%
Reenactment				
little bit	4 33%	4 22%		
quite a bit	5 42%	7 39%		
extremely	2 17%	4 22%		
Total positives	11 92%	15 83%	0.63 (Fis)	-18.2%;29.6%
Psychological distress				
little bit	7 58%	3 17%		
quite a bit	1 8%	10 56%		
extremely	4 33%	5 28%		
Total positives	12 100%	18 100%	*	*
Physiological reactivity				
little bit	7 58%	3 17%		
quite a bit	1 8%	10 56%		
extremely	4 33%	5 28%		
Total positives	12 100%	18 100%	*	*

Fis = Fisher's Exact Test

* = p-value and 95% CI can not be calculated

Table 4.5 indicates that there were no significant differences between the acute PTSD chronic group and the acute PTSD in-remission group on the positive response rates of any of the DSM-IV cluster B symptoms. The small group sizes could have influenced the significance of the results. On the other hand, cluster B symptoms (re-experiencing memories) might not be a good marker for chronic PTSD one month after the traumatic event. This therefore did not support findings that

suggested that intrusive recollections are highly predictive of long-term psychopathology in subjects exposed to disaster (Baum, 1990).

4.4.4.2 Cluster C: Avoidance and numbing of general responsiveness

The positive response rates and the severity of the avoidance and numbing of general responsiveness symptoms of the acute PTSD chronic group compared to those of the acute PTSD in-remission group are presented in table 4.6 and then discussed.

Table 4.6 The avoidance and numbing of general responsiveness symptoms of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the first assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Avoid thoughts/ feelings/ conversations				
little bit	1 8%	3 17%		
quite a bit	5 42%	7 39%		
extremely	5 42%	8 44%		
Total positives	11 92%	18 100%	0.40 (Chi)	-27.7%;8.9%
Avoid activities/ places/ people				
little bit	6 50%	7 39%		
quite a bit	4 33%	7 39%		
extremely	2 17%	3 17%		
Total positives	12 100%	17 94%	1.00 (Chi)	-12.7%;18.3%
Inability to recall				
little bit	4 33%	1 6%		
quite a bit	2 17%	3 17%		
extremely	1 8%	2 11%		
Total positives	7 58%	6 33%	0.18 (Chi)	-11.1%;55.6%
Diminished interest/ participation				
little bit	2 17%	5 28%		
quite a bit	5 42%	7 39%		
extremely	1 8%	2 11%		
Total positives	8 67%	14 78%	0.68 (Chi)	-42.1%;20.5%
Detachment/ estrangement				
little bit	6 50%	3 17%		
quite a bit	4 33%	4 22%		
extremely	- -	3 17%		
Total positives	10 83%	10 55%	0.24 (Chi)	-6.4%;53.7%
Restricted affect				
little bit	3 25%	10 55%		
quite a bit	4 33%	6 33%		
extremely	5 42%	2 11%		
Total positives	12 100%	18 100%	*	*
Foreshortened future				
little bit	6 50%	5 28%		
quite a bit	2 17%	3 17%		
extremely	2 17%	6 33%		
Total positives	10 83%	14 78%	1.00 (Chi)	-24.3%;31.5

Chi = Chi-square Test

* = p-value and 95% CI can not be calculated

Table 4.6 indicates that only the "inability to recall" and the "detachment and estrangement" symptoms seemed to have been experienced slightly more by the acute PTSD chronic group than by the acute PTSD in-remission group.

The inability to recall important aspects of the earth-fall event was experienced by 58% of the acute PTSD chronic group compared to 33% of the acute PTSD in-remission group (95% confidence interval of -11.1% to 55.6%). According to Scignar (1988), amnesia seems to protect people from the dysphoric emotional effects of the trauma. This suppression of symptoms may, however, prevent subjects from resolving emotional conflicts related to the event, which could predispose them to develop chronic symptoms.

"Detachment and estrangement" were experienced by 83% of the acute PTSD chronic group compared to the 55% of the acute PTSD in-remission group (95% confidence interval of -6.4% to 53.7%). According to the WHO (1992b) it is the social withdrawal that contributes most to impairment.

These results indicate that subjects who developed chronic PTSD tended to have more symptoms of amnesia related to the traumatic event as well as symptoms of detachment and estrangement during the acute phase. These symptoms could therefore have been markers for chronic PTSD in subjects with acute PTSD.

4.4.4.3 Cluster D: Symptoms of increased arousal

The positive response rates and the severity of the symptoms of increased arousal of the acute PTSD chronic group compared to those of the acute PTSD in-remission group are presented in table 4.7 and then discussed.

Table 4.7 The symptoms of increased arousal of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the first assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Difficult fall/stay asleep				
little bit	3 25%	7 39%		
quite a bit	3 25%	6 33%		
extremely	3 25%	4 22%		
Total positives	9 75%	17 94%	0.27 (Chi)	-45.0%;7.6%
Irritability/anger outbursts				
little bit	5 42%	3 17%		
quite a bit	1 8%	4 22%		
extremely	1 8%	1 6%		
Total positives	7 58%	8 44%	0.46 (Chi)	-21.8%;46.2%
Difficulty concentrating				
little bit	6 50%	9 50%		
quite a bit	2 17%	4 22%		
extremely	1 8%	1 6%		
Total positives	9 75%	14 78%	1.00 (Chi)	-33.5%;26.3%
Hypervigilance				
little bit	5 42%	6 33%		
quite a bit	3 25%	3 17%		
extremely	- -	2 11%		
Total positives	8 67%	11 61%	1.00 (Chi)	-28.7%;37.3%
Startle response				
little bit	3 25%	- -		
quite a bit	3 25%	5 28%		
extremely	2 17%	1 6%		
Total positives	8 67%	6 33%	0.07 (Chi)	-3.2%;62.0%

Chi = Chi-squared Test

Table 4.7 indicates that exaggerated **startle response** was the only symptom that was inclined to be experienced more by the acute PTSD chronic group than by the PTSD in-remission group. Sixty-seven per cent of the acute PTSD chronic group experienced exaggerated startle compared to the 33% of the acute PTSD in-remission group (p=0.07; 95% confidence interval of -3.2% to 62%).

This result indicated that an exaggerated startle response predisposed subjects to develop chronic PTSD. A few studies suggested that abnormal startle response might be a trait marker of PTSD. Such a trait may predispose the individual to strong conditioning (Orr et al., 1995; Shalev and Rogel-Fuchs, 1993). Further affirmation of these results would have valuable PTSD management implications, both in terms of the biological treatment of employees with acute PTSD and the identification of "at risk" individuals. This would promote preventative intervention.

4.4.5 Comorbid diagnoses

The acute PTSD chronic group was compared to the acute PTSD in-remission group in terms of the following comorbid disorders at the first assessment session:

1. general anxiety disorder as measured on the HARS;
2. major depressive disorder as measured on the HDRS;
3. alcohol abuse as assessed by the special investigations;
4. cannabis abuse as assessed by the special investigations.

The results are presented in table 4.8 and then discussed.

Table 4.8 Comorbid disorders in the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the first assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Complicated PTSD	58%	50%	0.65 (Chi)	-44.6%;27.9%
Median HARS score	15	10.5	0.28 (MW)	-12;3
Median psychic anxiety score	11	8	0.19 (MW)	-7;1
Median somatic anxiety score	3.5	2.5	0.48 (MW)	-6;2
Major anxiety	58%	44%	0.49 (Fis)	-50.0%;22.2%
Median HDRS score	15.3	12.8	0.61 (MW)	-8;4
Major depression	33%	17%	0.39 (Fis)	-48.4%;15.1%
Alcohol abuse	9%	18%	1.00 (Chi)	-16.3%;33.4%
Cannabis abuse	25%	18%	0.67 (Chi)	-37.8%;23.1%

Chi = Chi-squared Test

Fis = Fisher's Exact Test

MW = Mann-Whitney Test

Table 4.8 indicates that the **median HARS score** was 15 for the acute PTSD chronic group and 10.5 for the acute PTSD in-remission group. The **median psychic anxiety score** was 11 for the acute PTSD chronic group and 8 for the acute PTSD in-remission group. The **median somatic anxiety score** was 3.5 for the acute PTSD chronic group and 2.5 for the acute PTSD in-remission group. The **median HDRS score** was 15.3 for the acute PTSD chronic group and 12.8 for the acute PTSD in-remission group. **Major anxiety** and **major depression** were experienced by 58% and 33% of the subjects in the acute PTSD chronic group respectively, and by 44% and 17% of the acute PTSD in-remission group respectively. The results regarding substance abuse disorders were insignificant.

These results indicate that the acute PTSD chronic group, although not significantly so, tended to be more vulnerable to associated major depression and an anxiety disorder. They also seemed to experience the depression and anxiety with higher levels of severity than the acute PTSD in-remission group. It therefore seemed that the presence of anxiety or depressive disorders and their severity might have been related to an increased risk of developing chronic PTSD. These results supported reports by Moore and Boehnlein (1991) that major depression might increase the risk of trauma victims developing chronic PTSD. The results also indicated that the anxiety in both groups had more of a psychic than a somatic quality. This tendency was discussed in paragraph 3.4.5.

Not many subjects in either group experienced major depression in comparison to anxiety disorder. This probably supported the notion that depression only develops later in the clinical course of PTSD (Green et al., 1989). The higher prevalence of anxiety possibly also supported studies that consider PTSD as an anxiety syndrome (APA, 1994; Foa et al., 1995).

4.4.6 Associated PTSD symptoms measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the associated PTSD symptoms of the acute PTSD chronic group compared to those of the acute PTSD in-remission group are presented in table 4.9 and then discussed.

Table 4.9 The associated PTSD symptoms of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the first assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Nobody understands				
little bit	2 17%	3 17%		
quite a bit	3 25%	3 17%		
extremely	1 8%	1 6%		
Total positives	6 50%	7 39%	0.55 (Chi)	-23.9%;44.1%
Impairment function				
little bit	5 42%	5 28%		
quite a bit	5 42%	10 56%		
extremely	- -	3 17%		
Total positives	10 84%	18 100%	0.15 (Chi)	-38.6%;5.5%
Blaming self				
little bit	1 8%	3 17%		
quite a bit	2 17%	4 22%		
extremely	2 17%	3 17%		
Total positives	5 42%	10 56%	0.46 (Chi)	-46.2%;21.8%
Blaming others				
little bit	1 8%	- -		
quite a bit	- -	- -		
extremely	1 8%	2 11%		
Total positives	2 17%	2 11%	1.00 (Chi)	-19.1%;32.1%
Survival guilt				
little bit	- -	- -		
quite a bit	- -	- -		
extremely	1 8%	- -		
Total positives	1 8%	- -	0.40 (Chi)	-8.9%;27.7%
Hopelessness				
little bit	3 25%	3 17%		
quite a bit	1 8%	4 22%		
extremely	2 17%	3 17%		
Total positives	6 50%	10 56%	0.77 (Chi)	-39.3%;29.2%
little bit	3 25%	5 28%		
quite a bit	2 17%	2 11%		
extremely	5 42%	8 44%		
Total positives	10 83%	15 83%	1.00 (Chi)	-28.3%;25.4%
Thinking "why me?"				
little bit	3 25%	4 22%		
quite a bit	3 25%	2 11%		
extremely	3 25%	9 50%		
Total positives	9 75%	15 83%	0.66 (Chi)	-37.6%;20.3%
Thinking "only me"				
little bit	2 17%	4 22%		
quite a bit	3 25%	1 6%		

extremely	2	17%	1	6%		
Total positives	7	58%	6	33%	0.18 (Chi)	-11.1%;55.6%
Feel "going crazy"						
little bit	2	17%	1	6%		
quite a bit	2	17%	1	6%		
extremely	1	8%	1	6%		
Total positives	5	42%	3	17%	0.21 (Chi)	-8.2%;54.2%
Others are hostile						
little bit	1	8%	1	6%		
quite a bit	3	25%	2	11%		
extremely	-	-	-	-		
Total positives	4	33%	3	17%	0.39 (Chi)	-14.6%;46.2%
No one to rely on						
little bit	-	-	1	6%		
quite a bit	1	8%	-	-		
extremely	-	-	3	17%		
Total positives	1	8%	4	22%	0.62 (Chi)	-35.8%;14.3%
Depersonalization						
little bit	2	17%	1	6%		
quite a bit	1	8%	-	-		
extremely	-	-	2	11%		
Total positives	3	25%	3	17%	0.66 (Chi)	-20.3%;37.6%
Feel betrayed						
little bit	1	8%	-	-		
quite a bit	-	-	-	-		
extremely	-	-	-	-		
Total positives	1	8%	-	-	0.40 (Chi)	-8.9%;27.7%
Ancestors' message						
little bit	2	17%	4	22%		
quite a bit	2	17%	-	-		
extremely	-	-	-	-		
Total positives	4	33%	4	22%	0.68 (Chi)	-20.5%;42.1%
Bewitched						
little bit	1	8%	-	-		
quite a bit	-	-	1	6%		
extremely	3	25%	2	11%		
Total positives	4	33%	3	17%	0.39 (Chi)	-14.6%;46.2%
Ignored rituals						
little bit	1	8%	-	-		
quite a bit	1	8%	-	-		
extremely	-	-	-	-		
Total positives	2	17%	-	-	0.15 (Chi)	-5.5%;38.6%

Chi = Chi-squared Test

Table 4.9 indicates that none of the associated PTSD symptoms was experienced significantly more by the acute PTSD chronic group than by the acute PTSD in-remission group. The "thinking only me", the "feel going crazy", the "others are hostile", the "bewitched", and the "ignored rituals" symptoms tended to be experienced more, although not significantly so, by the acute PTSD chronic group than by the acute PTSD in-remission group.

Feeling that you are the only one who has suffered these events ("**thinking only me**") was experienced by 58% of the acute PTSD chronic group and by 33% of the acute PTSD in-remission group. "**Others are hostile**" was experienced by 33% of the acute PTSD chronic group and by 17% of the acute PTSD in-remission group. The "**feel going crazy**" symptom was experienced by 42% of the acute PTSD chronic group and by 17% of the acute PTSD in-remission group.

Believing that they had had an "**ancestral message**" to leave the mine was experienced by 33% of the acute PTSD chronic group and by 22% of the acute PTSD in-remission group. Feeling "**bewitched**" was experienced by 33% of the acute PTSD chronic group and by 17% of the acute PTSD in-remission group. The feeling that these earth-fall events was ancestral punishment for failure to comply with traditional beliefs and rituals ("**ignored rituals**"), was experienced by 17% of the acute PTSD chronic group.

The "thinking only me" symptom is in fact an irrational belief, therefore an indication of cognitive disintegration. The dynamics of this symptom have been discussed previously (see 3.4.6). The "thinking others are hostile" symptom, also a belief, can also be explained by the information-processing approach. The core beliefs of the trauma victim are threatened, also the belief that the world is benevolent. The individual learns that the world is not only a place in which negative events may happen, but also one in which people can no longer be trusted. Both the impersonal and personal world appear to be hostile (Janoff-Bulman, 1995; Roth & Newman, 1995).

These results indicate that subjects that presented with loss of trust in core beliefs that created a sense of meaning could have been more liable to develop chronic PTSD. The "feel going crazy" could have been an indication of the

severity of the general mood status of the subjects and may thus be a marker for chronic PTSD in mine employees with acute PTSD. It also seemed that subjects with acute PTSD that experience cultural related symptoms were more liable to develop chronic PTSD.

4.5 The acute PTSD chronic group (N=12) compared to the acute PTSD in-remission group (N=18) in terms of data received during the second assessment session.

At the second assessment session the acute PTSD chronic group suffered from chronic PTSD and the PTSD symptoms of the acute PTSD in-remission group were in remission. The acute PTSD chronic group was compared to the acute PTSD in-remission group in terms of the following data that was received at the second assessment session:

1. treatment and employment status (for example, whether the subjects have returned to their previous working environment) as assessed on the Treatment Questionnaire;
2. the nature of new earth-fall events as measured on the Mine Stress Factor Questionnaire;
3. the severity of acute and enduring stressors as measured on the Severity of Psycho-social Stressor Scale ;
4. the nature of other stressors as measured on the Holmes-Rahe Stress Scale;
5. the comorbid diagnoses received by each group as measured on the HDRS, the HARS and by the special investigations.

The results are subsequently presented and discussed.

4.5.1 Treatment and employment status

The acute PTSD chronic group was compared to the acute PTSD in-remission group in terms of the treatment they received and their employment status at the second assessment session. The results are subsequently presented in table 4.10 and then discussed.

Table 4.10 The employment status of and the treatment given to the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at second assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Pharmacology:				
Imipramine	2 17%	4 22%	1.00 (Fis)	-34.1%;23.0%
Employment status:				
Transferred	- -	2 11%	0.50 (Fis)	-25.6%;3.4%
Sick leave	1 8%	3 17%	0.63 (Fis)	-31.6%;14.9%
Normal work	8 67%	14 78%	0.68 (Fis)	-21.8%;44.0%

Fis = Fisher's Exact Test

Table 4.10 indicates that there were no significant differences between the acute PTSD chronic group and the acute PTSD in-remission group in terms of pharmacological treatment and employment status.

The results in table 4.10 show that Imipramine, an anti-depressant, was prescribed to 22% (4) of the acute PTSD in-remission group compared to the 17% (2) in the acute PTSD chronic group. Two (11.1%) of the subjects in the acute PTSD in-remission group were transferred to other areas of employment subsequent to psychological recommendation. They also received Imipramine for the PTSD. The three (17%) subjects in the acute PTSD in-remission group that were on sick leave

also received Imipramine. The majority of the subjects in both groups returned to their previous work.

These "transferred" and "sick leave" subjects did not have to return to their previous high-risk working environment. This, as well as the Imipramine treatment, may thus have contributed to the remission of the PTSD symptoms of these acute PTSD in-remission group subjects. These results could thus support suggestions that removal from situations that may resemble the initial traumatic event and reduced exposure to similar environments could improve the prognosis of PTSD victims (Solomon, 1990; Williams, 1993).

4.5.2 Stress factors

The acute PTSD chronic group was compared to the acute PTSD in-remission group in terms of the nature of new earth-fall events, the severity of acute and enduring stressors and the nature of other stressors. The results are summarized in table 4.11 and then discussed.

Table 4.11 The stress factors in the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the second assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Acute stressor:				
Only moderate	2 17%	1 6%		
Only catastrophic	3 25%	- -	0.05 (Fis)	0.5%;49.5%
New earth-falls	3 25%	- -	0.05 (Fis)	0.5%;49.5%
Enduring stressor:				
Mild levels	1 8%	1 6%		
Moderate levels	2 17%	3 17%		
Severe levels	8 67%	12 67%		
Extreme levels	1 8%	2 11%	1.00 (Fis)	-24.1%;18.6%
Other stressors:				
Death spouse	- -	- -		
Divorce/separation	- -	- -		
Death in family	4 33%	4 22%	0.68 (Fis)	-21.8%;44.0%
Marriage	- -	- -		
Sexual problems	1 8%	- -	0.40 (Fis)	-7.3%;24.0%
New born baby	1 8%	4 22%	0.62 (Fis)	-38.7%;10.9%
Death friend	2 17%	2 11%	1.00 (Fis)	-20.0%;31.2%
Change of work	1 8%	4 22%	0.62 (Fis)	-38.7%;10.9%
Problems in-laws	- -	- -		
Supervisor problem	- -	- -		
Change work circumstances	3 25%	3 17%	0.66 (Fis)	-21.6%;38.3%
Illness in family	3 25%	- -	0.05 (Fis)	0.5%;49.5%
See family only weekends or on holidays	12 100%	17 94%	1.00 (Fis)	-5.0%;16.1%
Less than month ago on leave	3 25%	4 22%	1.00 (Fis)	-28.4%;33.9%
More than 6 months ago on leave	8 67%	9 50%	0.37 (Chi)	-18.6%;52.0%
Leave due within 3 weeks	2 17%	3 17%	1.00 (Fis)	27.2%;27.2%
Miscellaneous	3 25%	2 11%	0.36 (Fis)	-14.6%;42.4%

Fis = Fisher's Exact Test

Chi = Chi-squared Test

Table 4.11 indicates that "new earth-fall events" were experienced by 25% of the acute PTSD chronic group, significantly more than those experienced by the

acute PTSD in-remission group ($p=0.05$; 95% confidence interval of 0.5% to 49.5%). Catastrophic levels of acute stress were also experienced by 25% of the acute PTSD chronic group, as opposed to substantially fewer than the acute PTSD in-remission group ($p=0.05$; 95% confidence interval of 0.5% to 49.5%).

The majority of both groups experienced severe to extreme levels of **enduring stress**. The reasons for these high levels of enduring stress have been discussed previously (see 3.2). Table 4.10 indicates that these groups did not differ significantly in terms of enduring stressors.

Health changes in the family were experienced by 25% of the acute PTSD chronic group and by no one in the acute PTSD in remission group. This was the only **other stressor** that was experienced by significantly more subjects in the acute PTSD chronic group than subjects in the acute PTSD in-remission group ($p=0.05$; 95% confidence interval of 0.5 to 49.5).

These results indicate that subjects who were exposed to new earth-fall events were vulnerable to the development of chronic PTSD. It therefore supported other reports that indicate that re-exposure to events that symbolize the initial traumatic event increases the risk of victims to continuing to experience PTSD symptoms (Kardiner, 1941; Solomon, 1990; Sorenson & Golding, 1990; Williams, 1993). Literature that indicates that exposure to other stressors may negatively influence the prognosis of people with PTSD (APA, 1994; Scrignar, 1988) was also supported.

4.5.3 Comorbid diagnoses

The acute PTSD chronic group and the acute PTSD in-remission group were compared in terms of the results on the HARS, the HDRS as well as the use of

alcohol and cannabis as measured by Special Investigations at the second assessment session. The results are presented in table 4.12 and then discussed.

Table 4.12 Comorbid disorders in the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) at the second assessment session.

	Acute PTSD chronic group (N=12)	Acute PTSD remission group (N=18)	p-value	95% CI for difference Acute PTSD chronic group minus Acute PTSD in-remission group
Complicated PTSD	83%	6%	<0.01 (Fis)	54.2%;100%
Median HARS score	22.5	1.5	<0.01 (MW)	12;25
Median psychic anxiety	14.5	1.5	<0.01 (MW)	15;10
Median somatic anxiety	7	0	<0.01 (MW)	3;12
Major anxiety	75%	6%	<0.01 (Chi)	42.8%;96.1%
Median HDRS score	19.5	2.2	<0.01 (MW)	9;21
Major depression	58%	-	<0.01 (Chi)	30.4%;86.2%
Alcohol	17%	11%	0.86 (Chi)	-20.0%;31.2%
Cannabis	25%	11%	0.46 (Chi)	-14.6%;42.4%

Chi = Chi-squared Test

MW = Mann-Whitney Test

Fis = Fisher's Exact Test

Table 4.12 indicates that comorbid psychiatric disorders (**complicated PTSD**) were experienced by 83% of the subjects in the acute PTSD chronic group, significantly more ($p < 0.01$) than the 6% of the acute PTSD in-remission group. Anxiety disorder (**major anxiety**) was experienced by 75% and **major depression** by 58% of the acute PTSD chronic group. Both these disorders were experienced significantly more by the acute PTSD chronic group than by the acute PTSD in-remission group ($p < 0.01$). The severity of the depression and anxiety as measured by the HDRS and HARS was also significantly worse ($p < 0.01$) for the acute PTSD chronic group than for the acute PTSD in-remission group.

Table 4.12 indicates that 58% of the PTSD chronic group experienced major depression at the second assessment session as opposed to 33% at the first assessment session (see table 4.8). Similarly, more subjects developed anxiety disorders at the second assessment session (75%) than at the first assessment session (58%, see table 4.8). The median HARS and median HDRS scores for the acute PTSD chronic group was also more severe at the second assessment (22.5 and 19.5) session than at the first assessment session (15 and 15.3; see table 4.8). Table 4.12 shows that the median psychic anxiety score (14.5) was more severe than the median somatic anxiety score (7) in the acute PTSD chronic group.

Table 4.12 indicates that alcohol abuse disorder was experienced by 17% and cannabis abuse by 25% of the subjects of the acute PTSD chronic group, whereas 11% of the acute PTSD in-remission group experienced alcohol and cannabis use related disorders. The differences were insignificant ($p=0.86$ and $p=0.46$).

The results indicated that subjects who developed chronic PTSD were vulnerable to develop pervasive comorbid anxiety and depressive disorders. These results therefore supported other studies that found an association between chronic PTSD and major depressive disorder (Moore & Boehnlein, 1991; Loughrey et al., 1993) and chronic PTSD and anxiety disorders (de Girolamo, 1992; Scott & Stradling, 1992). In addition there was a positive association between the severity of symptoms and chronic PTSD. Furthermore, these results indicated that the anxiety of subjects whose PTSD became chronic remained psychic (see 3.4.5). The results also indicated that anxiety and depressive disorders remitted when the acute PTSD disorder remitted.

It also appeared that the anxiety and depression symptoms were more severe at the second assessment session. These results indicated that symptoms became more incapacitating as the PTSD became chronic. The results supported statements that

depression only develops later in the clinical course of PTSD (Green et al., 1989).

These results, infact, did not support literature that found a positive relationship between substance abuse-related disorders and PTSD (de Girolamo, 1992; Scott & Stradling, 1992; Scrignar, 1988; Solomon, 1993). However, these results are based on the assessment 7 months after the precipitating traumatic event and can therefore change over time.

4.6 Summary

The results of the acute PTSD chronic group (N=12) compared with those of the acute PTSD in-remission group (N=18) are summarized as follows:

Pathogenesis

Modulating factors: The results indicated that living in an extended family arrangement and the perception of social support via the extended family, and adhering to cultural values (for example, contributing to the financial wellbeing of the extended family) could have improved the resistance of subjects with acute PTSD against developing chronic PTSD.

Stress factors: It was found that a history of previous trauma exposure, the severity of the precipitating traumatic events, the severity of enduring stressors, and the exposure to other premorbid stressors, increased the vulnerability of subjects with acute PTSD to develop chronic PTSD.

Subjects who were exposed to at least one previous traumatic event seemed to be more vulnerable to chronic PTSD. It also appeared that exposure to more than one

previous traumatic event could have resulted in subjects either becoming used to the trauma (stress inoculation) or learning to adapt successfully to a traumatic (stress resolution). This subsequently made them less liable to develop chronic PTSD.

It appeared that the PTSD symptoms were likely to remit when subjects were "transferred" or put on "sick leave" and/or received Imipramine treatment. These results thus supported suggestions that removal from situations resembling the initial traumatic event and reduced exposure to similar environments could improve the prognosis of PTSD victims (Solomon, 1990; Williams, 1993).

Predisposing factors: A family history of psychiatric disease and a personal history of PTSD and/or psychiatric illness did not create differences between subjects with acute PTSD in terms their liability to develop chronic PTSD.

Symptoms and signs

DSM-IV PTSD symptoms: The PTSD symptoms of the acute PTSD chronic group tended to be more severe than those of the acute PTSD in-remission group at the first assessment session.

The cluster B symptoms did not identify subjects with acute PTSD who would develop chronic PTSD. The inability to remember important aspects of the traumatic earth-fall event, and feelings of estrangement and detachment were the only cluster C symptoms that seemed to indicate vulnerability to chronic PTSD in subjects with acute PTSD. Exaggerated startle response was the only cluster D symptom that seemed to predict chronic PTSD in subjects with acute PTSD.

Comorbid diagnoses: The acute PTSD chronic group seemed more likely to have had major depression and an anxiety disorder during the acute phase. They also seemed to experience the depression and anxiety more severely the acute PTSD in-remission group. It therefore seemed that the presence of anxiety or depressive disorders and their severity during the acute phase might have predicted the development of chronic PTSD.

The results also indicated that subjects with chronic PTSD were more vulnerable to develop pervasive comorbid anxiety and depressive disorders seven months after the precipitating earth-fall accident. In addition there was a positive association between the severity of symptoms and chronic PTSD. The results also indicated that anxiety and depressive disorders remitted when the acute PTSD disorder remitted.

These results indicated that anxiety and depression symptoms became more incapacitating, as the PTSD became chronic. The results supported statements that depression only develops later in the clinical course of PTSD (Green et al., 1989).

Comorbid anxiety disorders were experienced more at both assessment sessions than depression, supporting the classification of PTSD as an anxiety disorder. The anxiety of subjects who developed chronic PTSD remained psychic over the seven month period of assessment.

Associated PTSD symptoms: Subjects who presented with loss of trust in core beliefs that created a sense of meaning (for example, feeling that you are the only one who suffered these events and feeling that others are hostile) seemed to be more vulnerable to chronic PTSD. The "feel going crazy" symptom appeared to have been an indication of the severity of the general mood status of the

subjects and could thus predict chronic PTSD. It also seemed that subjects with acute PTSD that experience culturally related symptoms were more vulnerable to chronic PTSD.

The small sizes of the two groups was possibly one of the main factors that prevented the results just described from being highly significant. The stress factors seemed to carry the most weight when predicting chronic PTSD in subjects with acute PTSD.

The symptoms and signs of PTSD are determined by the stage when the assessments are done (Horowitz, 1993; Scrignar, 1988). Information about the course of PTSD symptoms may assist in the diagnosis and treatment of PTSD victims. The symptoms and signs of the acute PTSD chronic group during the first assessment session were therefore compared to those of the second assessment session. These results are subsequently presented and discussed.

5. THE SYMPTOMS AND SIGNS OF THE ACUTE PTSD CHRONIC GROUP (N=12) AT THE FIRST ASSESSMENT SESSION COMPARED WITH THOSE OF THE SECOND ASSESSMENT SESSION.

The symptoms and signs of the acute PTSD chronic group (N=12) at the first and second assessment sessions were compared. The results are presented and discussed in the following order:

1. the severity of the PTSD as measured on the HTQ;
2. the severity of the intrusive and avoidance symptoms as measured on the IES;
3. the deterioration of the general levels of functioning as measured on the GAF scale;
4. the severity of the different DSM-IV PTSD symptoms and the positive response rates received by each symptom as measured on the HTQ;

5. the comorbid diagnoses received at each assessment session as measured on the HDRS, the HARS and the special investigations;
6. the associated symptoms experienced at each assessment session as measured on the HTQ are finally presented and discussed.

The HTQ scores, the IES scores, and the GAF scale results of the acute PTSD chronic group at the first assessment session compared to those of the second assessment session are summarized in table 5.1 and then discussed.

Table 5.1 The HTQ scores, the IES scores and the GAF Scale results of the acute PTSD chronic group (N =12) at the first assessment session compared with those of the second assessment session.

	ACUTE PTSD CHRONIC GROUP (N=12)		p-value*	95% confidence interval for difference between first and second assessment
	Acute symptoms	Chronic symptoms		
Median HTQ PTSD	2.3	2.5	0.55	-0.44;0.75
Median HTQ Total	2.1	2.3	0.78	-0.57;0.47
Median Total IES	43	46	0.89	-11;16
Median IES Intrusive	18.5	20.5	0.43	-4;7
Median IES Avoidance	23.5	25.5	0.53	-9;5
Median GAF score	20	23.3	0.31	0;5

* = Wilcoxon signed rank test

5.1 The severity of the PTSD as measured on the Harvard Trauma Questionnaire

Table 5.1 indicates that the median HTQ PTSD scores were slightly higher at the second assessment session (2.5) than at the first assessment session (2.3).

5.2 The severity of the intrusive and avoidance symptoms as measured on the Impact of Event Scale

The results in table 5.1 indicate that the median IES intrusive scores were slightly lower at the first assessment session (18.5) than at the second assessment session (20.6). The median IES avoidance scores were also lower during the first assessment session (23.5) than at the second assessment session (25.5). This may support other reports which indicated that avoidance symptoms become more pronounced during the latter stages of the syndrome (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989).

5.3 The deterioration of the general levels of functioning as measured on the General Assessment of Functioning Scale

Table 5.1 indicates that the median deterioration in general level of functioning, as measured by the GAF scale, was slightly higher (95% CI of 0 to 5) at the second assessment session (23.3) than at the first assessment session (20).

To summarize, these results seemed to indicate that PTSD symptoms were more severe during the second assessment session than during the first assessment session. The small size of this group unfortunately affected the significance of the results. In general, these results support literature which indicates that victims with PTSD experience most symptoms more severely in the latter stages of the syndrome (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; Scrignar, 1988; Southwick & Morgan et al., 1993; Desivilya et al., 1996). The insignificance of most of these results could have been due to the short time period between these assessment sessions and/or the small size of the group.

5.4 PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the DSM-IV cluster B, cluster C and cluster D PTSD symptoms, as measured on the HTQ of the acute PTSD chronic group at the first assessment session were compared to those of the second assessment session. The results are subsequently presented and discussed.

5.4.1 Cluster B: Re-experiencing symptoms

The positive response rates and the severity of the re-experiencing PTSD symptoms of the acute PTSD chronic group at the first assessment session compared to those of the second assessment session are summarized and presented in table 5.2 and then discussed. The results of the acute PTSD in-remission group, whose symptoms have per definition decreased at the second assessment session, are also shown in table 5.2 as a control.

The response patterns (for example, the number of subjects who had positive responses at both assessment sessions) of the acute PTSD chronic group in terms of the re-experiencing symptoms at the first assessment session and at the second assessment session are summarized in table 5.3. This information may provide an idea as to the variation in the symptoms over a course of seven months.

Table 5.2 The re-experiencing symptoms of the acute PTSD chronic group (N=12) at the first assessment session compared with those of the second assessment session.

		ACUTE PTSD CHRONIC GROUP (N=12)				95% confidence interval for the difference between first and second assessment	
		Acute symptoms	Chronic symptoms	p-value			
ACUTE PTSD CHRONIC GROUP (N=12)							
Intrusive recollections							
little bit	-	-	2	17%			
quite a bit	5	42%	7	58%			
extremely	6	50%	3	25%			
Total positives	11	92%	12	100%	1.00 (Mc)	-28.1%;11.5%	
Distressing dreams							
little bit	1	8%	3	25%			
quite a bit	2	17%	4	33%			
extremely	2	17%	-	-			
Total positives	5	42%	7	58%	0.68 (Mc)	-59.7%;26.4%	
Re-enactment							
little bit	4	33%	4	33%			
quite a bit	5	42%	4	33%			
extremely	2	17%	3	25%			
Total positives	11	92%	11	92%	*	*	*
Psychological distress							
little bit	7	58%	2	17%			
quite a bit	1	8%	6	50%			
extremely	4	33%	4	33%			
Total positives	12	100%	12	100%	*	*	*
Physiological reactivity							
little bit	7	58%	2	17%			
quite a bit	1	8%	6	50%			
extremely	4	33%	4	33%			
Total positives	12	100%	12	100%	*	*	*
ACUTE PTSD IN-REMISSION GROUP (N=18)							
Intrusive recollections							
Total positives	17	95%	12	67%	0.07 (Mc)	4.3%;51.2%	
Distressing dreams							
Total positives	9	50%	1	6%	0.01 (Mc)	18.7%;70.2%	
Re-enactment							
Total positives	15	83%	6	33%	0.01 (Mc)	24.1%;75.9%	
Psychological distress							
Total positives	18	100%	14	78%	0.13 (Mc)	0.24%;44.2%	
Physiological reactivity							
Total positives	18	100%	14	78%	0.13 (Mc)	0.24%;44.2%	

Mc = Mc Nemar Test for paired data.

* = Cannot be calculated.

Table 5.3 The response pattern of the acute PTSD chronic group (N=12) on the re-experiencing symptoms at the first assessment session compared with that of the second assessment session.

RE-EXPERIENCING SYMPTOMATOLOGY ACUTE PTSD CHRONIC GROUP (N=12)

	First/Second assessment responses			
	yes/yes	yes/no	no/no	no/yes
intrusion	11	-	-	1
nightmares	3	2	3	4
re-enactment	11	-	1	-
psycholog	12	-	-	-
physiolog	12	-	-	-

Table 5.2 indicates that 11 subjects of the acute PTSD chronic group experienced **intrusive recollections** during the first assessment session, whereas all the subjects (12 subjects) experienced intrusive recollections during the second assessment session. Table 5.3 shows that 11 subjects thus consistently experienced intrusive recollections over a period of seven months. In comparison, intrusive recollections were experienced by 17 (94%) subjects of the acute PTSD in-remission group (N=18) one month after the precipitating earth-fall accident, and by 12 (67%) subjects of the same group seven months after the same event.

Table 5.2 indicates that more subjects (7; 58%) in the acute PTSD chronic group experienced **distressing dreams** seven months after the traumatic earth-fall accidents than one month (5; 42%) after these incidents. Table 5.3 shows that only three (25%) subjects experienced distressing dreams consistently over a seven-month period.

According to table 5.2, 92% of the subjects in the acute PTSD chronic group experienced the symptom "**acting or feeling as if the event were recurring**" at both assessment sessions. Table 5.3 indicates that this symptom was also consistently experienced by 11 (92%) of the subjects over 7 months.

Table 5.2 and table 5.3 indicate that **psychological and physiological reactivity** upon exposure to situations that symbolize the precipitating traumatic event were consistently experienced by all the subjects over a period of seven months. These symptoms were experienced more severely seven months after the event than one month after the event. On the other hand, table 5.2 indicates that all the subjects (18; 100%) of the acute PTSD in-remission group experienced symptoms of physiological reactivity and psychological distress one month after the precipitating earth-fall accidents upon exposure to reminders of these events. The majority (14; 78%) of the acute PTSD in-remission group also experienced these symptoms at the second assessment session.

The high prevalence of intrusive recollection symptoms in the acute PTSD chronic group (N=12) and the acute PTSD in-remission group (N=18) seven months after the traumatic earth-fall events, supported findings by McFarlane (1988c) that intrusive recollections are very sensitive but not as specific for PTSD. McFarlane (1988c) also found intrusive recollections to be very sensitive 8 months after a fire disaster (McFarlane; 1988c).

The inconsistency of recurrent dreams in the acute PTSD chronic group supported reports by Madakasira and O'Brien (1987) that recurrent dreams are not very prevalent in non man-made trauma.

The fact that most of these subjects returned to working conditions that resembled circumstances related to the traumatic earth-fall accident may have contributed to the high prevalence of the re-enactment symptoms. According to Kolb and Mutalipassi (1982), re-enactment symptoms are learned behaviour or conditioned emotional responses. This type of symptom or "survival-dependant learned behaviour" may thus be difficult to extinguish (Kolb & Mutalipassi,

1985). This theoretical assumption may also give a reason for the consistency of this symptom over a period of seven months.

The high consistency of psychological and physiological symptoms that resemble the traumatic event supported statements by Loughrey et al. (1993) that these symptoms are frequently the most persistent PTSD symptoms in victims of trauma. These results may thus be a marker to identify mine employees with earth-fall induced PTSD. These symptoms were also found to be consistent in war-induced PTSD (Kolb, 1987) and motor vehicle accident-induced PTSD (Blanchard, Hickling, & Taylor, 1991).

The high prevalence of the symptoms "psychological distress and physiological reactivity" in the subjects of the acute PTSD in-remission group seven months after the earth-fall events, could be explained by the following factors: 1) The subjects in the acute PTSD in-remission group previously had PTSD. This may therefore still have rendered them vulnerable to these symptoms over a period of seven months. 2) Most of the subjects in the acute PTSD in-remission group continued to work in circumstances that resembled the traumatic incident. This may therefore have restrained complete extinction of these symptoms over a period of seven months.

To summarize, these results show that disturbing dreams was the only re-experiencing symptom in the acute PTSD chronic group that was not experienced consistently over a period of seven months. All the other re-experiencing symptoms were very consistent over a period of seven months. They seemed to be sensitive, but not very specific to PTSD.

5.4.2 Cluster C: Avoidance and numbing of general responsiveness

The positive response rates and the severity of the avoidance and numbing of general responsiveness symptoms of the acute PTSD chronic group at the first assessment session and the second assessment session accident are summarized and presented in table 5.4 and then discussed. The results of the acute PTSD in-remission group are also shown in table 5.4 to provide a frame of reference and control.

The response patterns of the acute PTSD chronic group in terms of the avoidance and numbing of general responsiveness symptoms at the first assessment session and the second assessment session are summarized in table 5.5 and then discussed.

Table 5.4 The avoidance and numbing of general responsiveness symptoms of the acute PTSD chronic group (N=12) at the first assessment session compared with those of the second assessment session.

ACUTE PTSD CHRONIC GROUP (N=12)				p-value	95% confidence interval for the difference between first and second assessment
Acute symptoms		Chronic symptoms			

ACUTE PTSD CHRONIC GROUP (N=12)				p-value	95% confidence interval for the difference between first and second assessment
Acute symptoms		Chronic symptoms			
Avoid thoughts/ feelings/ conversations					
little bit	1	8%	3	25%	
quite a bit	5	42%	4	33%	
extremely	5	42%	5	42%	
Total positives	11	92%	12	100%	1.00 (Mc) -28.1%;11.5%
Avoid activities/ places/ people					
little bit	6	50%	5	42%	
quite a bit	4	33%	4	33%	
extremely	2	17%	3	25%	
Total positives	12	100%	12	100%	* * *
Inability to recall					
little bit	4	33%	4	33%	
quite a bit	2	17%	-	-	
extremely	1	8%	-	-	
Total positives	7	58%	4	33%	0.45 (Mc) -20.0%;70.0%
Diminished interest/ participation					

little bit	2	17%	6	50%		
quite a bit	5	42%	3	25%		
extremely	1	8%	2	17%		
Total positives	8	67%	11	92%	0.37 (Mc)	-62.8%;12.8%
Detachment/ estrangement						
little bit	6	50%	2	17%		
quite a bit	4	33%	5	42%		
extremely	-	-	2	17%		
Total positives	10	83%	9	75%	1.00 (Mc)	-32.1%;48.7%
Restricted affect						
little bit	3	25%	4	33%		
quite a bit	4	33%	6	50%		
extremely	5	42%	2	17%		
Total positives	12	100%	12	100%	*	* *
Foreshortened future						
little bit	6	50%	5	42%		
quite a bit	2	17%	2	17%		
extremely	2	17%	2	17%		
Total positives	10	83%	9	75%	1.00 (Mc)	-32.1%;48.7%

ACUTE PTSD IN-REMISSION GROUP (N=18)**Avoid thoughts/ feelings/ conversations**

Total positives 18 100% 9 50% 0.01 (Mc) 24.1%;75.9%

Avoid activities/ places/ people

Total positives 17 94% 7 39% <0.01 (Mc) 29.8%;81.3%

Inability to recall

Total positives 6 33% 1 6% 0.07 (Mc) 4.3%;51.2%

Diminished interest/ participation

Total positives 14 78% 2 11% <0.01 (Mc) 37.2%;96.1%

Detachment/ estrangement

Total positives 10 56% 3 17% 0.05 (Mc) 8.8%;68.9%

Restricted affect

Total positives 18 100% 5 28% <0.01 (Mc) 48.8%;95.6%

Foreshortened future

Total positives 14 78% 1 6% <0.01 (Mc) 48.8%;95.7%

Mc = Mc Nemar Test for paired data.

* = Cannot be calculated.

Table 5.5 The response pattern of the acute PTSD chronic group (N=12) on the avoidance and numbing of general responsiveness symptoms at the first assessment session compared with that of the second assessment session.

AVOIDANCE/ NUMBING OF RESPONSIVENESS ACUTE PTSD CHRONIC GROUP (N=12)

First assessment /Second assessment responses

yes/yes yes/no no/no no/yes

avoid thoughts	11	-	-	1
avoid activity	12	-	-	-
unable recall	2	5	3	2
no interest	7	1	-	4
detachment	7	3	-	2
restricted affect	12	-	-	-
no future	7	3	-	2

Table 5.4 indicates that significantly fewer subjects of the acute PTSD in-remission group experienced all the cluster C symptoms at the second assessment session than at the first assessment session.

Table 5.4 indicates that all the subjects (12) in the acute PTSD chronic group experienced **avoidance of thoughts** at the second assessment session. Table 5.5 shows that avoidance of thoughts were consistently experienced by 11 (80%) of the acute PTSD chronic group subjects over a period of seven months. Table 5.5 indicates that all the subjects also consistently experienced **avoidance of activities** or situations that resembled the initial traumatic incident over a period of seven months.

According to Table 5.4, the **inability to recall** an important aspect of the earth-fall accident was experienced by fewer subjects in the acute PTSD chronic group at the second assessment session. Table 5.5 shows that only two subjects experienced this symptom at both the assessment sessions.

The results in table 5.4 indicate that slightly more subjects at the second assessment session (11) than at the first assessment (8) session experienced **diminished interest**. Table 5.5 shows that this symptom was also consistently experienced by the majority of the acute PTSD chronic group (7; 58%) over a period of seven months.

Table 5.4 indicates that **feelings of detachment and estrangement** were experienced by the majority of the acute PTSD chronic group at the first (10) and second (9) assessment session. Table 5.5 shows that seven (58%) subjects consistently experienced this symptom over a period of seven months.

Table 5.5 indicates that all the subjects consistently experienced **blunted affect or restricted range of affect** at both the first and second assessment sessions.

Table 5.4 shows that a sense of **foreshortened future** was experienced by the majority of the subjects at the first (10; 83%) and second assessment sessions (9; 76%). Table 5.5 indicates that it was consistently experienced by seven (58%) of the subjects over a period of seven months.

These results supported other findings that avoidance symptoms become more pronounced over time in people with chronic PTSD (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989).

The "inability to recall" symptom was difficult to assess because subjects were sensitive to this question. It appeared that thorough questioning about the incident was perceived by them as if the researcher did not believe them. Since all reportable accidents are followed by legal inquiries, mine employees may be sensitive to questioning. They appeared sensitive to questions that doubted their honesty. It is therefore possible that mine employees may say no questions that imply memory impairment. On the other hand McFarlane (1988c) also found a low prevalence of amnesia symptoms in victims of natural disasters.

The high consistency of the restricted range of affect symptoms supported McFarlane's (1986) findings about the high prevalence of constricted affect in victims with chronic PTSD. The fact that most of these subjects continued to work in circumstances resembling the initial earth-fall accident may have contributed to the high prevalence of this symptom in the acute PTSD chronic group. These numbing symptoms may have served to blunt the realities of danger.

These results indicate that the majority of subjects whose symptoms became chronic, consistently experienced cluster C PTSD symptoms. Avoidance of thoughts, feelings and conversations and avoidance of activities, places and people as well as symptoms of restricted affect, were highly sensitive and specific in subjects with chronic PTSD. An inability to recall important aspects of the traumatic event was the only symptom not consistently experienced by the subjects whose symptoms became chronic. These results supported the changes made to the DSM-IV PTSD diagnosis that at least three of the cluster C symptoms must be present to make a PTSD diagnosis (APA, 1994).

5.4.3 Cluster D: Symptoms of increased arousal

The positive response rates and the severity of the symptoms of increased arousal of the acute PTSD chronic group at the first assessment session and the second assessment session are summarized and presented in table 5.6 and then discussed. The results of the acute PTSD in-remission group are also shown in table 5.6 to provide a frame of reference and control.

The response patterns of the acute PTSD chronic group in terms of the symptoms of increased arousal at the first assessment session and the second assessment session are summarized in table 5.7 and then discussed.

Table 5.6 The symptoms of increased arousal of the acute PTSD chronic group (N=12) at the first assessment session compared with those of the second assessment session.

ACUTE PTSD CHRONIC GROUP (N=12)
 Acute symptoms Chronic symptoms p-value 95% confidence interval for the difference between first and second assessment

ACUTE PTSD CHRONIC GROUP (N=12)

Difficult fall/stay asleep

little bit	3	25%	4	33%		
quite a bit	3	25%	3	25%		
extremely	3	25%	1	8%		
Total positives	9	75%	8	67%	1.00 (Mc)	-23.7%;40.4%

Irritability/ anger outbursts

little bit	5	42%	3	25%		
quite a bit	1	8%	4	33%		
extremely	1	8%	1	8%		
Total positives	7	58%	8	67%	1.00 (Mc)	-40.4%;23.7%

Difficulty concentrating

little bit	6	50%	2	17%		
quite a bit	2	17%	7	58%		
extremely	1	8%	-	-		
Total positives	9	75%	9	75%	0.68 (Mc)	-44.4%;44.4%

Hypervigilance

little bit	5	42%	2	16%		
quite a bit	3	25%	7	58%		
extremely	-	-	3	25%		
Total positives	8	67%	12	100%	0.13 (Mc)	-64.2%;-2.5%

Startle response

little bit	3	25%	4	33%		
quite a bit	3	25%	4	33%		
extremely	2	17%	3	25%		
Total positives	8	67%	11	92%	0.37 (Mc)	-62.8%;12.8%

ACUTE PTSD IN-REMISSION GROUP (N=18)

Difficult fall/stay asleep

Total positives	17	94%	1	6%	<0.01 (Mc)	71.6%;100%
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Irritability/ anger outbursts

Total positives	8	44%	1	6%	0.02 (Mc)	13.6%;64.2%
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Difficulty concentrating

Total positives	14	78%	1	6%	<0.01 (Mc)	48.8%;95.7%
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Hypervigilance

Total positives	11	61%	3	17%	0.01 (Mc)	18.7%;70.2%
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Startle response

Total positives	6	33%	2	11%	0.22 (Mc)	-5.2%;49.6%
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Mc = Mc Nemar Test for paired data.

Table 5.7 The response pattern of the acute PTSD chronic group (N=12) on the symptoms of increased arousal at the first assessment session compared with that of the second assessment session.

AROUSAL SYMPTOMS ACUTE PTSD CHRONIC GROUP (N=12)				
	First assessment /Second assessment responses			
	yes/yes	yes/no	no/no	no/yes
sleep problems	7	2	2	1
irritable/anger	6	1	3	2
concentration	6	3	-	3
hypervigilance	8	-	-	4
startle	7	1	-	4

Table 5.6 indicates that the acute PTSD in-remission group experienced all the symptoms of increased arousal significantly less at the second assessment session.

Table 5.6 indicates that **sleeping problems** were experienced by 9 (75%) of the acute PTSD chronic group subjects at one month and, by 8 (67%) subjects at seven months after the precipitating earth-fall accidents. According to table 5.7, seven subjects (58%) experienced sleeping problems consistently over a period of seven months.

Table 5.6 shows that **irritability or an outburst of anger** was experienced by 7 (58%) of the acute PTSD chronic group subjects at one month and, by 8 (67%) subjects at seven months after the precipitating earth-fall accidents. According to table 5.7, six subjects (50%) experienced these symptoms consistently over a period of seven months.

Table 5.6 indicates that **impairment of concentration** was experienced by 75% of the acute PTSD chronic group one month after the earth-fall events. At seven months after the traumatic event impairment of concentration was also experienced

by 75% of the acute PTSD chronic group. According to table 5.7, this symptom was consistently experienced by 50% of the acute PTSD chronic group.

Table 5.6 shows that **hypervigilance** was experienced by 8 (67%) of the acute PTSD chronic group subjects at one month after and by all the subjects (12) at seven months after the precipitating earth-fall accident. They tended to experience this symptom more at the second assessment session (95% confidence interval for the difference between the first assessment session and the second assessment session of -64.2% to -2.5%). Table 5.7 shows that eight subjects (67%) consistently experienced this symptom over a period of seven months.

According to table 5.6 an **exaggerated startle** response was experienced by 8 (67%) of the acute PTSD chronic group subjects at one month after and by 11 (92%) subjects at seven months after the precipitating earth-fall accident. Table 5.7 indicates that 7 (58%) subjects consistently experienced this symptom over the period of seven months.

All the PTSD symptoms of increased arousal were thus consistently experienced by more than 50% of the acute PTSD chronic group. The "increased hypervigilance" and "exaggerated startle response" symptoms tended to become more prevalent over a seven-month period. These results support other reports that suggest that exaggerated startle and hypervigilance symptoms have a pervasive nature (Desivilya et al., 1996; Orr et al., 1995; Southwick & Morgan et al., 1993). The fact that most of these subjects continued to work in circumstances that resembled aspects of the traumatic event, could be one of the reasons that caused an increase of these symptoms.

5.5 Comorbid diagnoses

The following comorbid disorders of the acute PTSD chronic group at the first assessment session compared to those of the second assessment session are presented and then discussed:

1. general anxiety disorder as measured on the HARS;
2. major depressive disorder as measured on the HDRS;
3. alcohol abuse as assessed by the special investigations;
4. cannabis abuse as assessed by the special investigations.

The results are presented in table 5.8 and then discussed.

Table 5.8 Comorbid disorders in the acute PTSD chronic group (N=12) at the first assessment session compared with those of the second assessment session.

ACUTE PTSD CHRONIC GROUP (N=12)					95% confidence interval for the difference between first and second assessment
	Acute symptoms	Chronic symptoms	p-value		

ACUTE PTSD CHRONIC GROUP (N=12)

Complicated PTSD	7	58%	10	83%	0.25 (Mc)	-53.7%;3.7%
Median HARS score	15		22.5		0.29 (W)	-6;4
Median Psychic anxiety	11		14.5		0.77 (W)	-5;2
Median Somatic anxiety	3.5		7		0.07 (W)	-5;2
Major anxiety	7	58%	9	75%	0.48 (Mc)	-49.8%;8.6%
Median HDRS score	11.5		19.5		0.33 (W)	-6;3
Major depression	4	33%	7	58%	0.25 (Mc)	-53.7%;3.7%
Alcohol:						
on occasion	7	58%	5	42%		
nearly every day	-		2	17%	0.48 (Mc)	-41.9%;8.6%
Blood test g-GT	1	8%	2	17%	1.00 (Mc)	-28.1%;11.3%
refuse	1	8%	1	8%	*	* *

Cannabis:

on occasion	2	17%	-			
nearly every day	-		2	17%	0.48 (Mc)	-41.9%;8.6%
Urine cannabis test	3	25%	3	25%	0.48 (Mc)	-27.3%;27.3%
refuse	-		-			

ACUTE PTSD IN-REMISSION GROUP (N=18)

Complicated PTSD	9	50%	1	8%	0.01 (Mc)	11.6%;44.4%
Median HARS score	10.5		1.5		<0.01 (W)	4;17
Median Psychic anxiety	8		1.5		<0.01 (W)	2;12
Median Somatic anxiety	2.5		-		0.01 (W)	0;5
Major anxiety	8	44%	1	8%	0.02 (Mc)	13.6%;64.2%
Median HDRS score	12.5		1		<0.01 (W)	7;14
Major depression	3	17%	-	-	0.25 (Mc)	-3.3%;36.7%

Alcohol:

on occasion	16	89%	16	89%	*	* *
nearly every day	2	11%	2	11%	*	* *
Blood test g-GT	3	17%	2	11%	1.00 (Mc)	-7.8%;18.9%
refuse	1	8%	1	8%	*	* *

Cannabis:

on occasion	17	95%	17	95%	*	* *
nearly every day	1	8%	1	8%	*	* *
Urine cannabis test	3	17%	2	11%	1.00 (Mc)	-8.2;20.0%
refuse	1	8%	1	8%	*	* *

W = Wilcoxon Test

Mc = Mc Nemar Test for paired data.

* = Mc Nemar's p-value and 95% confidence interval cannot be calculated.

According to table 5.8, complicated PTSD was experienced by 7 (58%) of the acute PTSD chronic group subjects at the first assessment session and by 10 (83%) subjects at the second assessment session. The seven subjects (58%) who experienced a comorbid disorder at the first assessment session continued to experience a comorbid disorder at the second assessment session.

Table 5.8 shows that the acute PTSD chronic group had a median anxiety score of 15 at the first assessment session and 22.5 at the second assessment session. Seven (58%) subjects experienced an anxiety disorder at the first assessment session and nine (75%) subjects experienced it at the second assessment session.

Table 5.8 indicates that the acute PTSD chronic group had a median depression score 11.5 at the first assessment session and 19.5 at the second assessment session. Four (33%) subjects experienced major depressive disorder at the first assessment session and seven (58%) experienced it at the second assessment session.

Table 5.8 indicates that the acute PTSD in-remission group experienced significantly less ($p=0.01$) complicated PTSD at the second assessment session than at the first assessment session. Comorbid anxiety disorder ($p=0.02$) and severity of anxiety ($p<0.01$) was also significantly less at the second assessment session. Major depression (95% CI for the difference between the first assessment session and the second assessment session of -3.3% to 36.7%) and the severity of depressive symptoms ($p=0.01$) had also decreased significantly by at the second assessment session.

Table 5.8 indicates that substance abuse related disorders (alcohol and cannabis) were not experienced significantly by either groups at either assessment sessions. These findings supported other studies that indicate that substance abuse should not be stereotypically linked with chronic PTSD (Breslau et al., 1991; Rundell et al., 1989). The reasons for this low prevalence of substance abuse in these subjects could be related to the following factors: 1) the small size of the acute PTSD chronic group; 2) seven months after the date of the precipitating traumatic earth-fall event may not be long enough to confirm tendencies of increased alcohol abuse in subjects with chronic PTSD symptoms; 3) the selected nature of the research population could contribute to the fact that this population may be less likely to develop substance abuse disorders.

In general, comorbid anxiety and depression tended to be experienced by more of the subjects with chronic PTSD at the second assessment session. The small size

of the group unfortunately affected the significance of results. These results therefore supported literature that report a high frequency of Axis I comorbidity in chronic PTSD patients (Escobar et al., 1983; Friedman, 1990; Green, Lindy, & Grace, 1985; Lating et al., 1995; Roszell et al., 1991; Scott & Stradling, 1992). More specifically they supported findings which indicate that anxiety disorders are a complicating factor in chronic PTSD (Davidson et al., 1990; Engdahl et al., 1991) and findings which indicate that depression becomes more prevalent in subjects who develop chronic PTSD (Loughrey et al., 1993; Roszell et al., 1991).

5.6 Associated PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the associated PTSD symptoms of the acute PTSD chronic group at the first assessment session and the second assessment session are summarized and presented in table 5.9 and then discussed. The results of the acute PTSD in-remission group are also shown in table 5.9 to provide a frame of reference and control.

The response patterns of the acute PTSD chronic group in terms of the associated PTSD symptoms at the first assessment session and the second assessment session are summarized in table 5.10 and then discussed.

Table 5.9 The associated PTSD symptoms of the acute PTSD chronic group (N=12) at the first assessment session compared with those of the second assessment session.

		ACUTE PTSD CHRONIC GROUP (N=12)			95% confidence
		Acute	Chronic	p-value	interval for the
		symptoms	symptoms		difference between
					first and
					second assessment
ACUTE PTSD CHRONIC GROUP (N=12)					
nobody understands					
little bit	2	17%	2	17%	
quite a bit	3	25%	2	17%	
extremely	1	8%	4	33%	
Total positives	6	50%	8	67%	0.62 (Mc) -52.1%;18.8%
impairment function					
little bit	5	42%	5	42%	
quite a bit	5	42%	7	58%	
extremely	-	-	-	-	
Total positives	10	83%	12	100%	0.48 (Mc) -41.9%;8.6%
blaming self					
little bit	1	8%	5	42%	
quite a bit	2	17%	-	-	
extremely	2	17%	2	17%	
Total positives	5	42%	7	59%	0.72 (Mc) -66.0%;32.7%
blaming others					
little bit	1	8%	1	8%	
quite a bit	-	-	1	8%	
extremely	1	8%	-	-	
Total positives	2	17%	2	17%	0.62 (Mc) -36.8%;36.8%
survival guilt					
little bit	-	-	1	8%	
quite a bit	-	-	-	-	
extremely	1	8%	-	-	
Total positives	1	8%	1	8%	0.48 (Mc) -27.2%;27.2%
hopelessness					
little bit	3	25%	5	42%	
quite a bit	1	8%	4	33%	
extremely	2	17%	1	8%	
Total positives	6	50%	10	83%	0.13 (Mc) -64.1%;-2.4%
ashamed					
little bit	3	25%	3	25%	
quite a bit	2	17%	5	42%	
extremely	5	42%	1	8%	
Total positives	10	83%	9	75%	1.00 (Mc) -11.4%;28.1%
thinking "why me?"					
little bit	3	25%	5	42%	
quite a bit	3	25%	2	17%	
extremely	3	25%	5	42%	
Total positives	9	75%	12	100%	0.25 (Mc) -53.7%;3.7%
thinking "only me"					
little bit	2	17%	5	42%	

quite a bit	3	25%	2	17%		
extremely	2	17%	1	8%		
Total positives	7	58%	8	67%	1.00 (Mc)	-48.7%;32.1%
feel "going crazy"						
little bit	2	17%	2	17%		
quite a bit	2	17%	2	17%		
extremely	1	8%	1	8%		
Total positives	5	42%	5	42%	0.62 (Mc)	-36.8%;36.8%
others are hostile						
little bit	1	8%	-	-		
quite a bit	3	25%	2	17%		
extremely	-	-	1	8%		
Total positives	4	33%	3	25%	1.00 (Mc)	-11.5%;28.1%
no one to rely on						
little bit	-	-	4	33%		
quite a bit	1	8%	-	-		
extremely	-	-	-	-		
Total positives	1	8%	4	33%	0.25 (Mc)	-53.6%;3.6%
depersonalization						
little bit	2	17%	1	8%		
quite a bit	1	8%	-	-		
extremely	-	-	-	-		
Total positives	3	25%	1	8%	0.62 (Mc)	-18.8%;52.1%
feel betrayed						
little bit	1	8%	-	-		
quite a bit	-	-	-	-		
extremely	-	-	-	-		
Total positives	1	8%	-	-	1.00 (Mc)	-11.5%;28.1%
ancestors' message						
little bit	2	17%	1	8%		
quite a bit	2	17%	-	-		
extremely	-	-	2	16%		
Total positives	4	33%	3	25%	1.00 (Mc)	-32.1%;48.7%
bewitched						
little bit	1	8%	1	8%		
quite a bit	-	-	1	8%		
extremely	3	25%	3	25%		
Total positives	4	33%	5	42%	1.00 (Mc)	-28.1%;11.5%
ignored rituals						
little bit	1	8%	-	-		
quite a bit	1	8%	1	8%		
extremely	-	-	-	-		
Total positives	2	17%	1	8%	1.00 (Mc)	-23.7%;40.4%

ACUTE PTSD IN-REMISSION GROUP (N=18)

nobody understands						
Total positives	7	39%	-	-	0.02 (Mc)	13.6%;64.2%
impairment function						
Total positives	18	100%	3	17%	<0.01 (Mc)	63.3%;100%
blaming self						
Total positives	10	56%	1	6%	<0.01 (Mc)	24.1%;75.9%
blaming others						
Total positives	2	11%	1	6%	1.00 (Mc)	-15.9%;27.0%
survival guilt						
Total positives	-	-	-	-	-	-
hopelessness						
Total positives	10	56%	3	17%	0.07 (Mc)	4.8%;73.0%
ashamed						

Total positives thinking "why me?"	15	83%	4	22%	<0.01 (Mc)	35.8%;86.4%
Total positives thinking "only me"	15	83%	8	44%	0.02 (Mc)	13.6%;64.2%
Total positives feel "going crazy"	6	33%	2	11%	0.22 (Mc)	-5.2%;49.6%
Total positives others are hostile	3	17%	-	-	0.25 (Mc)	-3.3%;36.7%
Total positives no one to rely on	3	17%	-	-	0.25 (Mc)	-3.3%;36.7%
total positives depersonalization	4	22%	1	6%	0.25 (Mc)	-3.3%;36.7%
Total positives feel betrayed	3	17%	-	-	0.25 (Mc)	-3.3%;36.7%
Total positives ancestors' message	-	-	-	-	-	-
Total positives bewitched	4	22%	1	6%	0.25 (Mc)	-9.2%;42.5%
Total positives ignored rituals	3	17%	3	17%	0.48 (Mc)	-18.2%;18.2%
Total positives	-	-	-	-	-	-

Mc = Mc Nemar Test for paired data.

Table 5.10 The response pattern of the acute PTSD chronic group (N=12) on the associated symptoms at the first assessment session compared with that of the second assessment session.

ASSOCIATED SYMPTOMATOLOGY ACUTE PTSD CHRONIC GROUP (N=12)

First assessment /Second assessment responses
yes/yes yes/no no/no no/yes

	yes/yes	yes/no	no/no	no/yes
none understand	5	1	3	3
impair function	10	-	-	2
blame self	2	3	2	5
blame others	-	2	8	2
survival guilt	-	1	10	1
hopelessness	6	-	2	4
ashamed	9	1	2	-
"why me?"	9	-	-	3
"only me"	5	2	2	3
feel going crazy	3	2	5	2
others hostile	3	1	8	-
none to rely on	1	0	8	3
depersonalization	-	3	8	1
feel betrayed	-	1	11	-
ancestors	1	3	6	2
bewitched	4	-	7	1
rituals	-	2	9	1

Table 5.9 shows that 6 (50%) of the subjects of the acute PTSD chronic group experienced the feeling **no one understands** what happened to you at the first

assessment session and 8 (67%) experienced it at the second assessment session. According to table 5.10, five (45%) consistently experienced it at both assessment sessions.

Table 5.10 indicates that 10 (83%) of the acute PTSD chronic group consistently experienced **impairment** of general levels of **functioning**. According to table 5.9, all of them experienced deterioration of functioning at the second assessment session.

Table 5.9 shows that feelings of **hopelessness** were experienced by 10 (83%) of the subjects at the second assessment, significantly (95% CI for the difference between the first and the second assessment session of -64.1% to -2.4%) more than the 6 (50%) of the first assessment session. Table 5.10 indicates that 6 (50%) subjects consistently experienced feelings of hopelessness at both assessment sessions.

Table 5.9 indicates that **feeling ashamed** of the hurtful traumatic events that happened to you" was experienced by 10 (83%) of the acute PTSD chronic group at the first assessment session and by 9 (75%) at the second assessment session. Table 5.10 shows that 9 (75%) subjects of the acute PTSD chronic group consistently experienced this symptom at both assessment sessions.

According to table 5.9, the **thinking "why me?"** symptom was experienced by all (100%) the subjects of the acute PTSD chronic group at the second assessment session, which tended to be more than at the first assessment session (9; 100%). Table 5.10 indicates that this symptom was consistently experienced by 9 (75%) of the subjects at both assessment sessions.

According to table 5.9, seven (58%) of the acute PTSD chronic group experienced the feeling "**only me**" symptom at the first assessment session while 8 (67%) did so the second assessment session. This symptom was consistently experienced by five (42%) of subjects at both assessment sessions.

Table 5.10 indicates that feelings of **being bewitched** was the only cultural related symptom that was experienced consistently at both assessment sessions by both mentioned groups. Four subjects (33%) of the acute PTSD chronic group experienced it at both assessment sessions. According to table 5.9, four subjects (33%) experienced it at the first assessment session and 5 subjects (45%) experienced it at the second assessment session. In comparison, 3 subjects (17%) of the acute PTSD in-remission group consistently experienced it at both assessment sessions.

The other symptoms were not experienced consistently over the period of seven months. Most of these associated symptoms decreased significantly from the first to the second assessment session in the acute PTSD in-remission group. This was as expected, per definition, of this group.

The high consistency of the mentioned associated symptoms supported other reports that have shown that subjects with chronic PTSD experience more symptoms as well as increased levels of impaired functioning (APA, 1994; Scrignar, 1988; Solomon, 1993). The higher prevalence of the hopelessness symptom at the second assessment session, as well as its consistency over the two sessions, supported van der Kolk's (1988) statement that PTSD is a disorder of hope in many victims.

The consistency of the "feeling ashamed" symptom indicated that this symptom could be a marker for chronic PTSD in mine employees exposed to earth-fall accidents. It also supported literature that indicates shame to be a consistent

symptom in traumatized victims (Boehnlein, Kinzie, Ben, & Fleck, 1985; Kinzie, 1993).

The high consistency of the "spending time thinking why these events happened to you" (why me) in the acute PTSD chronic group could also indicate its reliability as a marker for chronic PTSD in mine employees exposed to earth-fall accidents. The dynamics of this symptom in the development of PTSD were discussed previously (see 3.4.5).

Although only a few subjects in both groups experienced feelings of bewitchment, they were experienced consistently over seven months. It is therefore possible that perceptions of bewitchment reflect a certain level of adherence to cultural values rather than merely the effects of the trauma.

To summarize, a feeling that nobody understands, impairment of general functioning, hopelessness, feeling ashamed, and spending time wondering why these events happened to you and why only to you, were consistently experienced by the majority of the acute PTSD chronic group over a period of seven months. These associated symptoms therefore seemed to be good markers for chronic PTSD. Symptoms of bewitchment appeared to be rather an indicator of cultural adherence rather than an indicator of trauma impact.

5.7 Summary

The results of the acute PTSD chronic group (N=12) at the first assessment session compared to those of the second assessment session, are summarized as follows:

Symptoms and signs

DSM-IV PTSD symptoms: The PTSD symptoms of the acute PTSD chronic group were more severe during the second assessment session than at the first assessment session. Both the intrusive and avoidance symptomatology became more severe at the second assessment session. The impairment of functioning was also more severe at the second assessment session.

Re-experiencing symptoms were very consistent over a period of seven months. They seemed to be sensitive, but not very specific to chronic PTSD. The results show that disturbing dreams was the only re-experiencing symptom in the acute PTSD chronic group that was not experienced consistently over a period of seven months.

These results indicate that the majority of subjects whose symptoms became chronic consistently experienced cluster C PTSD symptoms. Avoidance of thoughts, feelings and conversations and avoidance of activities, places and people as well as symptoms of restricted affect, were highly sensitive and specific to subjects with chronic PTSD. An inability to recall important aspects of the traumatic event was the only symptom that was not consistently experienced by the subjects whose symptoms became chronic.

The majority of the acute PTSD chronic group consistently experienced all the cluster D PTSD symptoms. The "increased hypervigilance" and "exaggerated startle response" symptoms tended to become more prevalent over a seven-month period.

Comorbid diagnoses: Comorbid anxiety and depressive disorders in subjects who developed chronic PTSD tended to be more severe and more prevalent at the second assessment session than at the first assessment session. The results supported

literature that reports a high frequency of Axis I comorbidity in chronic PTSD patients.

Associated PTSD symptoms: The feeling that nobody understands, impairment of general functioning, hopelessness, feeling ashamed, and spending time wondering why these events happened to you and why only to you, were consistently experienced by the majority of the acute PTSD chronic group over a period of seven months. These associated symptoms seemed to be good markers for chronic PTSD. Symptoms of bewitchment appeared to be an indicator of cultural adherence rather than an indicator of trauma impact.

To conclude, chronic PTSD seemed to be more severe than acute PTSD in mine employees. The results supported findings that suggest a higher comorbidity in chronic PTSD, with the exception of substance related disorders within a period of seven months after the traumatic event.

Subjects with chronic PTSD (chronic PTSD group) at the first assessment session due to previous traumatic events (see figure 3) were compared to subjects with acute PTSD at the first assessment session (acute PTSD group). The earth-fall accident had a re-traumatizing effect on the already existing chronic PTSD symptoms of the chronic PTSD group. On the other hand the earth-fall event had a precipitating effect on the symptoms of the acute PTSD group. The results of the acute PTSD group compared to those of the chronic PTSD group are subsequently presented.

6. THE CHRONIC PTSD GROUP (N=16) COMPARED TO THE ACUTE PTSD GROUP (N=33) IN TERMS OF DATA RECEIVED DURING THE FIRST ASSESSMENT SESSION.

The chronic PTSD group (N=16) were compared to the acute PTSD group (N=33) in terms of the data received during the first assessment session.

Pathogenic factors that predispose subjects to develop chronic PTSD have been assessed and discussed in the comparative evaluation between the acute PTSD chronic group (N=12) and the acute PTSD in-remission group (N=18; see4.). Pathogenic factors that predispose subjects to develop chronic PTSD will therefore not be presented and discussed again in the comparative evaluation between the chronic PTSD group (N=16) and the acute PTSD group (N=33). Only the comparative results regarding the symptoms and signs (at the first assessment session) of the chronic PTSD group and the acute PTSD group are therefore presented and discussed.

6.1 Symptoms and signs

The results of the acute PTSD group compared to those of the chronic PTSD group are presented in the following order:

1. the severity of the PTSD as measured on the HTQ;
2. the severity of the intrusive and avoidance symptoms as measured on the IES;
3. the deterioration of the general levels of functioning as measured on the GAF scale;
4. the severity of the different DSM-IV PTSD symptoms and the positive response rates received by each symptom as measured on the HTQ;
5. the comorbid diagnoses received by each group as measured on the HDRS, the HARS and by the special investigations;

6. the associated symptoms experienced by each group as measured on the HTQ are finally presented and discussed.

The HTQ scores, the IES scores, and the GAF scale results of the chronic PTSD group compared to those of the acute PTSD group at the first assessment session are summarized in table 6.1 and then discussed.

Table 6.1 The HTQ scores, the IES scores and the GAF Scale results of the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)	Acute PTSD group (N=33)	p-value*	95% CI for difference chronic PTSD group minus acute PTSD group
Median HTQ PTSD score	2.6	2.3	0.18	-0.13;0.63
Median HTQ Total score	2.3	2.0	0.03	0.03;0.67
Median total IES score	52.5	44.0	0.18	-3;15
Median intrusive score	24.5	19.0	0.28	-3;8
Median avoidance score	28.5	25.0	0.09	-1;8
Median GAF score	17.5	20.0	0.15	-10;0

* = Mann-Whitney Test

6.1.1 The severity of the PTSD as measured on the Harvard Trauma Questionnaire

Table 6.1 indicates that the chronic PTSD group had a median HTQ Total score of 2.3, significantly higher ($p=0.03$; 95% CI of 0.03 to 0.67) than the score of 2.0 of the acute PTSD group. Table 6.1 shows that the difference between the median HTQ PTSD scores of these two groups was not significant.

6.1.2 The severity of the intrusive and avoidance symptoms as measured on the Impact of Event Scale

Table 6.1 indicates that the chronic PTSD group had a median intrusive score of 24.5, which tended to be higher (95% CI of -3 to 8) than the score of 19.0 of the acute PTSD group. Table 6.1 shows that median avoidance score of the chronic PTSD group also tended to be higher (95% CI of -1 to 8) than that of the acute PTSD group.

According to table 6.1, the median avoidance scores of both these groups were respectively higher than their median intrusive scores. The possible reasons have been discussed previously (see 3.4.2).

6.1.3 The deterioration of the general levels of functioning as measured on the General Assessment of Functioning Scale

Table 6.1 indicates that the deterioration of general levels of functioning of the chronic PTSD group was 17.5, which tended to be slightly lower (95% CI of -10 to 0) than the 20.0 of the acute PTSD group.

The fact that the acute PTSD group reported more impairment of functioning than the chronic PTSD group, could be due to their better awareness of the difference between their premorbid levels of functioning and their current levels of functioning. Their GAF score may thus have been more reliable than that of the chronic PTSD group. The chronic PTSD group may have become accustomed to their symptoms. They may therefore have been unable to differentiate effectively between premorbid levels and current levels of functioning. The chronic PTSD group may therefore have underreported the severity of deterioration of functioning.

These results indicate that the chronic PTSD group experienced symptoms more severely than the acute PTSD group did. It supported results of other studies that indicated that symptoms in PTSD subjects become more pronounced over time (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989). The results indicate that subjects with chronic PTSD, who were re-exposed to trauma, experienced more severe symptoms than subjects with acute PTSD. These results also verify the stress vulnerability perspective (Selye, 1976).

6.1.4 PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the DSM-IV cluster B, cluster C and cluster D PTSD symptoms, as measured on the HTQ, of the chronic PTSD group were compared to those of the acute PTSD group. The results are subsequently presented and discussed.

6.1.4.1 Cluster B: Re-experiencing symptoms

The positive response rates and the severity of the re-experiencing PTSD symptoms of the chronic PTSD group compared to those of the acute PTSD group at the first assessment session are presented in table 6.2 and then discussed.

Table 6.2 The re-experiencing symptoms of the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)	Acute PTSD group (N=33)	p-value	95% CI for difference chronic PTSD group minus acute PTSD group
Intrusive recollections				
little bit	4 25%	6 18%		
quite a bit	8 50%	13 39%		
extremely	4 25%	11 33%		
Total positives	16 100%	30 91%	0.54 (Fis)	-0.7%;18.9%
Distressing dreams				
little bit	3 19%	7 21%		
quite a bit	3 19%	5 15%		
extremely	3 19%	4 12%		
Total positives	9 56%	16 49%	0.61 (Chi)	-21.9%;37.5%
Re-enactment				
little bit	6 38%	8 24%		
quite a bit	7 44%	14 42%		
extremely	2 13%	7 21%		
Total positives	15 94%	29 88%	1.00 (Fis)	-10.4%;22.1%
Psychological distress				
little bit	4 25%	12 36%		
quite a bit	2 13%	11 33%		
Extremely	9 56%	10 30%		
Total positives	15 94%	33 100%	0.33 (Fis)	-18.1%;5.6%
Physiological reactivity				
little bit	4 25%	12 36%		
quite a bit	2 13%	11 33%		
Extremely	9 56%	10 30%		
Total positives	15 94%	33 100%	0.33 (Fis)	-18.1%;5.6%

Chi = Chi-squared Test

Fis = Fisher's Exact Test

Table 6.2 indicates that the majority of both the chronic PTSD group and the acute PTSD group experienced the re-experiencing symptoms. Only nightmares were experienced less often. The difference between the two groups on all the re-experiencing symptoms was not significant.

It is possible that the exposure to the earth-fall event one month prior to the first assessment may have eliminated any possible differences between these two

groups. In fact, Pitman, van der Kolk, Orr and Greenberg (1990) stated that the B criteria of PTSD (intrusion) are phasic, in other words they are manifested only from time to time, especially when they are evoked by some salient environmental event. In this study the salient environmental event was the earth-fall incident. On the other hand, re-experiencing symptoms may not be very specific in differentiating between victims with acute and chronic PTSD. McFarlane (1986) found re-experiencing phenomena to have the lowest specificity of all PTSD phenomena.

6.1.4.2 Cluster C: Avoidance and numbing of general responsiveness

The positive response rates and the severity of the avoidance and numbing of general responsiveness symptoms of the chronic PTSD group compared to those of the acute PTSD group are presented in table 6.3 and then discussed.

Table 6.3 The avoidance and numbing of general responsiveness symptoms of the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)	Acute PTSD group (N=33)	p-value	95% CI for difference chronic PTSD group minus acute PTSD group
Avoid thoughts/ feelings/ conversations				
little bit	4 25%	4 12%		
quite a bit	3 19%	15 46%		
extremely	9 56%	13 39%		
Total positives	16 100%	32 97%	0.69 (Fis)	-2.8%;8.9%
Avoid activities/ places/ people				
little bit	3 19%	14 42%		
quite a bit	11 69%	12 36%		
extremely	2 13%	6 18%		
Total positives	16 100%	32 97%	1.00 (Fis)	-2.8%;8.9%
Inability to recall				
little bit	6 38%	5 15%		
quite a bit	4 25%	6 18%		
extremely	- -	3 9%		
Total positives	10 63%	14 42%	0.19 (Chi)	-9.0%;49.2%
Diminished interest/ participation				
little bit	2 13%	7 21%		
quite a bit	6 38%	14 42%		
extremely	5 31%	3 9%		
Total positives	13 81%	24 73%	0.73 (Fis)	-15.9%;32.9%
Detachment/ estrangement				
little bit	6 38%	7 30%		
quite a bit	4 25%	14 24%		
extremely	3 19%	3 9%		
Total positives	13 81%	21 64%	0.32 (Fis)	-7.6%;42.8%
Restricted affect				
little bit	7 44%	13 39%		
quite a bit	6 38%	13 39%		
extremely	3 19%	7 21%		
Total positives	16 100%	33 100%	*	* *
Foreshortened future				
little bit	5 31%	12 36%		
quite a bit	4 25%	6 18%		
extremely	5 31%	8 24%		
Total positives	14 88%	26 79%	0.69 (Fis)	-12.7%;30.1%

Chi = Chi-squared Test.

Fis = Fisher's Exact Test.

* = Can not be calculated.

Table 6.3 indicates that the chronic PTSD group tended to experience cluster C symptoms more than the acute PTSD group did. However, these differences were not

significant. The fact that both groups were exposed to similar trauma (the earth-fall accidents) approximately one month prior to the time of assessment as well as the small group sizes, may have had a diminishing effect on the differences.

These results seemed to indicate avoidance and numbing of general responsiveness to have been more pronounced in subjects with chronic PTSD. These results seemed to support reports that suggest that victims of trauma with chronic PTSD may experience emphasized cluster C symptoms (Davidson et al., 1991; Green et al., 1993; Kinzie & Fleck, 1987; McFarlane, 1988c; Solomon, 1989).

6.1.4.3 Cluster D: Symptoms of increased arousal

The positive response rates and the severity of the symptoms of increased arousal of the chronic PTSD group compared to those of the acute PTSD group are presented in table 6.4 and then discussed.

Table 6.4 The symptoms of increased arousal of the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)	Acute PTSD group (N=33)	p-value	95% CI for difference chronic PTSD group minus acute PTSD group
Difficult fall/stay asleep				
little bit	3 19%	11 33%		
quite a bit	6 38%	11 33%		
extremely	4 25%	7 21%		
Total positives	13 81%	29 88%	0.67 (Fis)	-28.8%;15.5%
Irritability/ anger outbursts				
little bit	4 25%	8 24%		
quite a bit	3 19%	6 18%		
extremely	1 6%	2 6%		
Total positives	8 50%	16 49%	0.92 (Chi)	-28.3%;31.4%
Difficulty concentrating				
little bit	4 25%	15 46%		
quite a bit	6 38%	8 24%		
extremely	1 6%	3 9%		
Total positives	11 69%	26 79%	0.49 (Fis)	-36.7%;16.6%
Hypervigilance				
little bit	6 38%	13 39%		
quite a bit	5 31%	6 18%		
extremely	2 13%	2 6%		
Total positives	13 81%	21 64%	0.32 (Fis)	-7.6%;42.8%
Startle response				
little bit	3 19%	3 9%		
quite a bit	2 13%	8 24%		
extremely	9 56%	3 9%		
Total positives	14 88%	14 42%	<0.01 (Chi)	21.7%;68.5%

Chi = Chi-squared Test.

Fis = Fisher's Exact Test.

Table 6.4 indicates that the **startle response** was experienced by 88% of the chronic PTSD group and by 42% of the acute PTSD group. It was the only cluster D PTSD symptom that was experienced significantly more by the chronic PTSD group than by the acute PTSD group ($p < 0.01$; 95% CI of 21.7% to 68.5%). The majority (56%) of the chronic PTSD group also experienced the startle response at extreme levels of severity. Similar results were found in the comparison between the acute PTSD chronic group and the acute PTSD in-remission group (see 4.4.4.3).

These results indicate that subjects with chronic PTSD were more likely to have experienced exaggerated startle response. The re-exposure to the last earth-fall accident may have contributed to the severity of this symptom. This result supported a statement of Solomon (1993) that reactivated trauma is worse than the original because the second traumatization is compounded by the residues of the first, which, lingered on in many cases, even in those individuals who recovered superficially. It also supported the theoretical assumptions of the Two Factor Model (Keane, Zimmering and Caddell, 1985). According to this model, the core physiology of posttraumatic stress is the physiology of arousal of the central nervous system, the autonomic nervous systems, and various neuroendocrine effector mechanisms. The patient suffering from posttraumatic stress is one who is best thought of as neurologically sensitized (that is, possessing a neurologically hypersensitivity or lowered functional threshold for neurologic hyperexcitation).

6.1.5 Comorbid diagnoses

The chronic PTSD group was compared to the acute PTSD group in terms of the following comorbid disorders at the first assessment session:

1. general anxiety disorder as measured on the HARS;
2. major depressive disorder as measured on the HDRS;
3. alcohol abuse as assessed by the special investigations;
4. cannabis abuse as assessed by the special investigations.

The results are presented in table 6.5 and then discussed.

Table 6.5 Comorbid disorders in the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)		Acute PTSD group (N=33)		p-value	95% CI for difference chronic PTSD group and acute PTSD group
Complicated PTSD	10	63%	18	55%	0.59 (Chi)	-21.2%;37.1%
Median HARS score	28		15		0.05 (MW)	0;18
Median psychic anxiety	17.5		10		0.05 (MW)	0;8
Median somatic anxiety	8.5		3		0.08 (MW)	0;9
Major anxiety	10	63%	17	52%	0.63 (Fis)	-18.2%;40.2%
Median HDRS score	19		12		0.10 (MW)	-1;10
Major depression	10	63%	9	27%	0.04 (Fis)	7.1%;63.4%
Alcohol abuse	4	27%	4	13%	0.41 (Fis)	-11.5%;39.1%
Cannabis abuse	4	27%	6	19%	0.70 (Fis)	-18.2%;34.1%

Chi = Chi-squared Test.

Fis = Fisher's Exact Test.

MW = Mann-Whitney Test.

Table 6.5 indicates that complicated PTSD was experienced by 63% of the chronic PTSD group and by 55% of the acute PTSD group. The difference was not significant.

According to table 6.5 the median HARS score of the chronic PTSD group was 28, which was significantly more severe ($p=0.05$) than the score of 15 of the acute PTSD group. Table 6.5 shows that the median psychic anxiety ($p=0.05$; 95% CI of 0 to 8) and the median somatic anxiety ($p=0.08$; 95% CI of 0 to 9) of the chronic PTSD group tended to be higher than those of the acute PTSD group. Table 6.5 indicates that the majority of both the chronic PTSD group (63%) and the acute PTSD group (52%) had associated anxiety disorders.

Table 6.5 indicates that the median HDRS score of 19 of the chronic PTSD group tended to be higher (95% CI of -1 to 10) than the score of 12 of the acute PTSD

group. Table 6.5 shows that major depression was experienced by 63% of the chronic PTSD group, as opposed to 27% ($p=0.04$) by the acute PTSD group.

Table 6.5 indicates that alcohol and cannabis abuse in the chronic PTSD group did not differ significantly from that in the acute PTSD group.

These results therefore indicated that the chronic PTSD group were more vulnerable to comorbid major depressive disorder. This supported studies that found a strong association between chronic PTSD and major depressive disorder (Engdahl et al., 1991; Loughrey et al., 1993). The anxiety and depressive symptoms were more severe in the chronic PTSD group, which supported statements by Scrignar (1988) that base-line anxiety increases when PTSD subjects are re-traumatized. The high prevalence of anxiety in both groups supported studies that regard PTSD as an anxiety syndrome (APA, 1994; Foa et al., 1995).

6.1.6 Associated PTSD symptoms as measured on the Harvard Trauma Questionnaire

The positive response rates and the severity of the associated PTSD symptoms of the chronic PTSD group were compared to those of the acute PTSD group and the results are presented in table 6.6 and then discussed.

Table 6.6 The associated PTSD symptoms of the chronic PTSD group (N=16) compared with those of the acute PTSD group (N=33) at the first assessment session.

	Chronic PTSD group (N=16)	Acute PTSD group (N=33)	p-value	95% CI for difference chronic PTSD group minus acute PTSD group
nobody understands				
little bit	4 25%	5 15%		
quite a bit	3 19%	6 18%		
extremely	2 13%	2 6%		
Total positives	9 56%	13 39%	0.27 (Chi)	-12.6%;46.3%
impaired function				
little bit	4 25%	10 30%		
quite a bit	11 69%	18 55%		
extremely	- -	3 9%		
Total positives	15 94%	31 94%	1.00 (Chi)	-14.6%;14.2%
blaming self				
little bit	6 38%	5 15%		
quite a bit	2 13%	6 18%		
extremely	5 31%	6 18%		
Total positives	13 81%	17 52%	0.06 (Fis)	4.1%;55.4%
blaming others				
little bit	1 6%	1 3%		
quite a bit	- -	- -		
extremely	- -	3 9%		
Total positives	1 6%	4 12%	1.00 (Fis)	-22.1%;10.4%
survival guilt				
little bit	2 13%	- -		
quite a bit	- -	- -		
extremely	2 13%	1 3%		
Total positives	4 25%	1 3%	0.03 (Fis)	-0.04%;44.0%
hopelessness				
little bit	3 19%	7 21%		
quite a bit	4 25%	5 15%		
extremely	4 25%	5 15%		
Total positives	11 69%	17 52%	0.25 (Chi)	-11.2%;45.6%
ashamed				
little bit	3 19%	8 24%		
quite a bit	3 19%	5 15%		
extremely	10 63%	13 39%		
Total positives	16 100%	26 79%	0.08 (Fis)	7.2%;35.2%
think "why me?"				
little bit	2 13%	7 21%		
quite a bit	6 38%	5 15%		
extremely	8 50%	14 42%		
Total positives	16 100%	26 79%	0.08 (Fis)	7.2%;35.2%
think "only me"				
little bit	7 44%	7 21%		
quite a bit	1 6%	4 12%		
extremely	2 13%	3 9%		

Total positives	10	63%	14	42%	0.19 (Chi)	-9.0%;49.2%
Feel "going crazy"						
little bit	1	6%	3	9%		
quite a bit	2	13%	3	9%		
extremely	4	25%	2	6%		
Total positives	7	44%	8	24%	0.19 (Fis)	-8.9%;47.9%
others are hostile						
little bit	3	19%	2	6%		
quite a bit	2	13%	5	15%		
extremely	3	19%	-	-		
Total positives	8	50%	7	21%	0.05 (Fis)	0.6%;57.0%
no one to rely on						
little bit	-	-	1	3%		
quite a bit	3	19%	1	3%		
extremely	6	38%	3	9%		
Total positives	9	56%	5	15%	<0.01 (Fis)	13.9%;68.3%
depersonalization						
little bit	4	25%	3	9%		
quite a bit	-	-	1	3%		
extremely	-	-	2	6%		
Total positives	4	25%	6	18%	0.71 (Fis)	-18.1%;31.8%
feel betrayed						
little bit	3	19%	1	3%		
quite a bit	2	13%	-	-		
extremely	-	-	-	-		
Total positives	5	31%	1	3%	0.01 (Fis)	4.8%;51.7%
ancestors' message						
little bit	-	-	6	18%		
quite a bit	1	6%	-	-		
extremely	2	13%	2	6%		
Total positives	3	19%	8	24%	1.00 (Fis)	-29.6%;18.6%
bewitched						
little bit	2	13%	1	3%		
quite a bit	-	-	2	6%		
extremely	3	19%	5	15%		
Total positives	5	31%	8	24%	0.73 (Fis)	-20.0%;34.0%
ignored rituals						
little bit	-	-	1	3%		
quite a bit	-	-	1	3%		
extremely	1	6%	-	-		
Total positives	1	6%	2	6%	1.00 (Fis)	-14.2%;14.6%

Chi = Chi-squared Test.

Fis = Fisher's Exact Test.

Table 6.6 indicates that the majority of the chronic PTSD group experienced the thought "**nobody understands**" (that is, feeling that people do not understand what happened to you). Although not significant, there seemed to be an inclination (95% CI of -12.6% to 46.3%) that the chronic PTSD group (56%) experienced this symptom more than the acute PTSD group (39%) did.

According to table 6.6, the "**blaming self**" symptom was experienced by 81% of the chronic PTSD group, significantly more (95% confidence interval of 4.1% to 55.4%) than the 52% of the acute PTSD group.

Table 6.6 shows that, "**survival guilt**" was experienced by 4 (25%) subjects in the chronic PTSD group, as opposed to the one (3%; $p=0.03$) of the the acute PTSD group.

Table 6.6 indicates that the "feeling **ashamed** of the events that happened to you" symptom was experienced by 100% of the chronic PTSD group, as opposed to 79% (95% confidence interval of 7.2% to 35.2%) of the acute PTSD group.

According to table 6.6, all the subjects of the chronic PTSD group experienced the "**why me?**" symptom, significantly more (95% confidence interval of 7.2% to 35.2%) than the 79% of the acute PTSD group.

Table 6.6 indicates that the symptom "**others are hostile**" was experienced by 50% of the chronic PTSD group compared to 21% of the acute PTSD group. It was experienced significantly more by the chronic PTSD group ($p=0.05$; 95% confidence interval of 0.6% to 57%).

According to table 6.6, the symptom "**no one to rely on**" was experienced by 56% of the chronic PTSD group, significantly more ($p<0.01$; 95% confidence interval of 13.9 to 68.3) than the 15% of the acute PTSD group.

Table 6.6 shows that the symptom "**feeling betrayed**" was experienced by only 31% of the chronic PTSD group. This was significantly more than the 3% experienced by the acute PTSD group ($p=0.01$; 95% confidence interval of 4.8 to 51.7).

Cultural related symptoms, namely, "feeling that the accident was a **message from the ancestors**", "feeling that you are **bewitched**" and "feeling that the accident was a result of not adhering to the **traditional rituals**" were not significantly more in the chronic PTSD group than in to the acute PTSD group. The insignificance of these symptoms might have indicated that subjects did not regress to previously held beliefs when their symptoms became chronic. It might therefore have been a reflection of the process of acculturation in these subjects.

These results show that the chronic PTSD group experienced the symptoms of "blaming self for what has happened", "feeling ashamed about what happened" and "survival guilt" significantly more so than did the acute PTSD group. The dynamics of these symptoms have been discussed earlier (see 3.4.6 and 4.4.6). The chronic PTSD group was, however, also exposed to a history of significantly more than one, two, and three traumatic events than the acute PTSD group. This could therefore have put them at more risk of experiencing these symptoms.

The symptoms "no one understands", "feeling betrayed", "feelings that others are hostile towards you", and "feelings that you have no one to rely on", all seemed to indicate some kind of impairment in interpersonal relationships. The fact that the chronic PTSD group experienced these symptoms significantly more so may have indicated personality changes that had occurred in them. These results supported other studies that showed that victims with chronic PTSD experience change in personality and impairment of interpersonal relationships (APA, 1994; Scignar, 1988; World Health Organization, 1992). The implication could be detrimental in terms of relationships in the workplace with subsequent effects on safety and production.

These symptoms can be psycho-dynamically explained by the information-processing model (Janoff-Bulman, 1995). The three basic assumptions are threatened by the experience of trauma. For example, the assumption that "the world is benevolent", a world in which not only good things happen, but also one in which people are good, is being questioned by the victim of trauma. The individual learns that the world is not only a place in which negative events may happen, but also one in which people can no longer be trusted. Both the impersonal and personal world appears to be hostile (Janoff-Bulman, 1995). The assumption of meaningfulness is seriously threatened because of difficulty in making sense of the meaningfulness of trauma.

The higher total HTQ PTSD score (see table 6.1) of the chronic PTSD group might have been a result of the associated symptoms experienced by the chronic PTSD group. Various reports have indicated that symptoms of PTSD become more generalized as the syndrome becomes chronic (APA, 1994; Scrignar, 1988), even to the extent that a personality change may be experienced (Scrignar, 1988; Vargas & Davidson, 1993). It is therefore possible that these associated symptoms could have been better indicators for unidentified chronic PTSD than the PTSD symptoms themselves.

To summarize, these results indicate that subjects with chronic PTSD presented more with associated PTSD symptoms. The symptom presentation seemed to indicate that the subjects with chronic PTSD experienced impairment of interpersonal relationships and possible personality change. It also indicated that associated symptomatology might be better indicators for chronic PTSD than the PTSD symptoms themselves. It supported studies that stated that individuals with unidentified chronic PTSD might present with other symptoms that could mask the PTSD symptoms (Scrignar, 1988; Solomon, 1993).

6.2 Summary

The results of the chronic PTSD group compared to those of the acute PTSD group at the first assessment session are summarized as follows:

Symptoms and signs

DSM-IV PTSD symptoms: The results indicate that subjects with chronic PTSD, who were re-exposed to trauma, experienced more severe symptoms than subjects with acute PTSD did.

The results show that the chronic PTSD group did not differ significantly from the acute PTSD group in terms of the re-experiencing symptoms. The results suggest re-experiencing symptoms to have been sensitive but not very specific to acute or chronic PTSD. On the other hand, these results indicate that avoidance and numbing of general responsiveness tended to have been more pronounced in subjects with chronic PTSD. Exaggerated startle response was found to be the only cluster D PTSD symptom that was experienced significantly more by the chronic PTSD group than by the acute PTSD group. These results indicate that subjects with chronic PTSD were more likely to have experienced exaggerated startle response and that "exaggerated startle" may have predicted chronic PTSD.

Comorbid diagnoses: These results indicated that the chronic PTSD group was more vulnerable to comorbid major depressive disorder. The anxiety and depressive symptoms were also more severe in the chronic PTSD group. The high prevalence of anxiety in both the chronic and acute PTSD groups supported studies that regard PTSD as an anxiety syndrome.

Associated PTSD symptoms: According to these results, subjects with chronic PTSD presented more with associated PTSD symptoms. The symptom presentation seemed to indicate that the subjects with chronic PTSD experienced impairment of interpersonal relationships and possible personality change. It also indicated that associated symptomatology might be better indicators for chronic PTSD than the PTSD symptoms themselves. It supported studies that stated that individuals with unidentified chronic PTSD might present with other symptoms that could mask the PTSD symptoms

According to figure 3, only three subjects were diagnosed PTSD with delayed onset seven months after the precipitating earth-fall accident. The delayed onset PTSD group constituted 2% of the total sample. The delayed onset PTSD group is subsequently presented and discussed.

7. THE DELAYED ONSET PTSD GROUP (N=3)

Owing to the small size of this group the results are subsequently presented in a case study format.

7.1 Case 1

First assessment session

The following data was received at the first assessment session.

Modulating factors:

The first subject was a 49-year-old Xhosa-speaking male person with no formal education. He was the first-born male child in his family. He was married, lived in an extended family arrangement in a rural area. When at work he stayed in the

unisexural male hostels. He visited his family only on long weekends and on holidays. He was responsible for the financial support of the extended family. He was employed as a machine operator and had 18 years experience in the mining industry.

Stress factors:

He had been previously exposed to a traumatic earth-fall accident (1993) and traumatic ethnic violence (1991). He experienced the precipitating earth-fall event as life-threatening; he had been pinned by rocks, and the accident happened unexpectedly. There was no light at the time of the event; he experienced suffocation; was severely injured (injury severity score of 9), and a friend was also injured. At times he lost consciousness. He experienced horror, extreme fear and helplessness. By the time of the first assessment session he had already returned to work.

Another stressor 12 months prior to the accident was the death of a friend. Living circumstances were an ongoing stress factor. This subject had been on leave more than 6 months previously.

Predisposition:

The subject reported a first-degree family history of depression and alcohol abuse disorder. He reported no personal history of any psychiatric disease.

Symptoms:

The subject was not suffering from PTSD, depression, anxiety disorder, or a substance related disorder at the first assessment session. The culturally related symptom "bewitchment" was experienced to mild degree. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 1.1

- Total HTQ score = 1.1
- IES = 3
- HARS = 7
- HDRS = 1

The results were therefore not indicative of stress-related problems.

Second assessment session:

The following data was received at the second assessment session.

New stress factors:

The subject returned to work in the same environmental circumstances as those in which the traumatic accident had occurred. His living circumstances did not change. He had not been involved in any other traumatic event since the mentioned earth-fall accident.

Symptoms:

At the second assessment session, the subject was diagnosed as suffering from a delayed onset PTSD. He also experienced comorbid underground phobia. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 2.6
- Total HTQ score = 2
- IES = 35 (Avoidance =24; Intrusion=11)
- HARS = 14
- HDRS = 8

These results indicate that this subject was experiencing severe avoidance symptoms as opposed to the intrusive symptoms. The PTSD symptoms being

experienced at extreme levels of severity were: acting or feeling as if the event were happening again, exaggerated startle response, avoiding activities that remind one of the traumatic event, and physiological and psychological reaction when exposed to situations similar to the traumatic event. Extreme associated symptoms were "feeling that you have no one to rely on", and "feeling that the ancestors are telling you to leave the mine". The feeling of being bewitched was still being experienced to a mild degree. This subject stated that he could not trust his colleagues anymore because of their "don't care" attitude concerning mine accidents and mine safety.

The subject experienced a moderate degree of functional deterioration compared to his premorbid levels of functioning.

Conclusion:

This subject was genetically predisposed to develop PTSD. He was furthermore sensitized by a history of traumatic experiences. The last earth-fall accident was catastrophic. No specific events were identified which could have triggered the delayed onset of symptoms.

The fact that he returned to work in a similar environment as that in which the accident had occurred, together with the strong predisposition, may have triggered the onset of the PTSD symptoms. Furthermore, the fact that he lost faith in his colleagues may also have served as an additional stressor. However, it can not be determined whether the loss of faith in his colleagues is a symptom of his PTSD or whether it is a fact. According to the stress vulnerability perspective (Selye, 1976) any person who is chronically exposed to severe stress will eventually develop stress-related symptoms.

7.2 Case 2

First assessment session

The following data was recieved at the first assessment session.

Modulating factors:

The second subject was a 39-year-old Sotho-speaking male person with a standard one education. He was the first-born male child of his family. He was married, lived in an extended family arrangement in the rural areas. When at work he stayed in the unisexual male hostels. He visited his family only on long weekends and on holidays. He was also responsible for the financial support of the extended family. He was employed as a machine operator and had 19 years experience in the mining industry.

Stress factors:

He had a history of witnessing a fatal underground mine accident (1989) and had also experienced a traumatic earth-fall accident (1989) in which he had been injured. During the precipitating earth-fall event he experienced a life threatening event, had been pinned by rocks, and the accident had happened unexpectedly. He was alone when it happened. There was no light at the time of the event, he experienced suffocation and life-threatening injuries (injury severity score of 19). A colleague was also injured. He experienced horror, extreme fear and helplessness. At the time of the first assessment session he was still on sick leave.

Other stress factors prior to the earth-fall accident were conflicts with neighbours at his rural home. His living circumstances were an ongoing stress factor.

Predisposition:

This subject reported no family history of any psychiatric disorder. He also reported no personal history of any psychiatric disease.

Symptoms:

This subject was not suffering from PTSD, depression, an anxiety disorder, or a substance related disorder at the first assessment session. However, he felt to a severe degree, that he was bewitched and that his ancestors were telling him to leave the mines. He stated that his neighbours were jealous of him and had bewitched him. According to him they did not want him to be prosperous. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 1.1
- Total HTQ score = 1.1
- IES = 2
- HARS = 2
- HDRS = 2

The results are thus not indicative of any stress-related problems.

Second assessment session:

The following data was received at the second assessment session.

New stress factors:

The subject had not yet returned to work at the time of the second assessment session. He was still on sick leave. His living circumstances had not changed. His uncle had died since the first assessment session. He also heard about a

catastrophic shaft accident where a cage had fallen and more than 100 employees were killed. He experienced it negatively.

Symptoms:

At the second assessment session, this subject was diagnosed as suffering from a delayed onset PTSD. He also experienced a comorbid anxiety disorder and minor depression. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 2.9
- Total HTQ score = 2.4
- IES = 56 (Avoidance =30; Intrusion=26)
- HARS = 20
- HDRS = 17

These results indicate that this subject was experiencing severe symptoms. The anxiety was primary and more severe than the depressive symptoms. The avoidance symptoms were more severe than the intrusive symptoms. The PTSD symptoms being experienced at extreme intensity levels were: intrusive thoughts about the event; exaggerated startle response; avoiding activities that remind one of the traumatic event; avoiding thoughts and feelings that remind one of the event, and physiological and psychological reaction when exposed to situations similar to the traumatic event.

Self blame was also experienced at extreme levels. The feeling that he was bewitched was mild and less severe than at the first assessment session.

Finally, this subject's general level of functioning deteriorated markedly.

Conclusion:

This subject was predisposed by stressful circumstances at home, a history of traumatic experiences. He was sensitized by exposure to catastrophic levels of stress during the earth-fall event with subsequent life-threatening injuries. The onset of delayed symptoms seemed to have been triggered by the disastrous cage accident about which he had heard. The fact that his injuries were improving and that a return to underground work was imminent may also have contributed to the symptom development. According to Modlin (1983), injuries may temporarily defuse the stress response by giving the patient something real to focus on. This may also have been the case in this subject.

7.3 Case 3**First assessment session**

The following data was received at the first assessment session.

Modulating factors:

The third subject was a 34 year old Xhosa-speaking male person with a standard four education. He was the last born male-child of his family. He was married, lived in a nucleus family arrangement in a rural area. When at work he stayed in the unisexual male hostels. He visited his family only on long weekends and on holidays. He was only responsible for the financial support of his wife and children. He was employed as a mining assistant and had 8 years experience in the mining industry.

Stress factors:

He did not have a history of exposure to previous traumatic events. He experienced the sensitizing earth-fall event as life-threatening and the accident

had happened unexpectedly. He was not pinned or trapped by the rocks. He had experienced moderate injuries (injury severity score of 4). The event was endured with extreme levels of anxiety and fear. By the time of the first assessment session he was already back at work, in conditions similar to those in which the accident had occurred.

Another stress factor 12 months prior to the earth-fall accident was the fact that his wife had given birth to his child. The living circumstances were an ongoing stress factor.

Predisposition:

This subject reported no family history of any psychiatric disorder and no personal history of any psychiatric disease.

Symptoms:

This subject was not suffering from PTSD, depression, an anxiety disorder, or a substance related disorder at the first assessment session. In fact, the subject denied any symptoms at the first assessment session. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 1
- Total HTQ score = 1
- IES = 0
- HARS = 0
- HDRS = 0

The results do not indicate any stress-related problems.

Second assessment session:

The following data were received at the second assessment session.

New stress factors:

Since the first assessment session, the subject had been working in conditions similar to those in which the accident occurred. His living circumstances had not changed. The subject reported that he had witnessed three hit-and-run motor vehicle accidents since the previous assessment sessions. He also complained of backache due to injuries after the earth-fall accident.

Symptoms:

At the second assessment session, this subject was diagnosed as suffering from a delayed onset PTSD. He also experienced a comorbid anxiety disorder and minor depressive symptoms. His scores on the different symptom questionnaires were as follows:

- PTSD score on HTQ = 2.8
- Total HTQ score = 2.2
- IES = 56 (Avoidance =25; Intrusion=31)
- HARS = 19
- HDRS = 13

This subject experienced severe PTSD symptoms. The intrusive symptoms were more severe than the avoidance symptoms. The anxiety symptoms were primary and more severe than the depressive symptoms. The PTSD symptoms, which had been experienced at extreme levels of severity were: intrusive thoughts about the event, nightmares, irritability or anger outbursts, and an exaggerated startle response. This subject's general level of functioning deteriorated markedly.

Conclusion:

This subject appeared to be in a process of acculturation which may have predisposed him to develop a PTSD (see 4.1). The fact that he was younger and had fewer years of mining experience could have been modulating factors. These features were found to be associated with the development of PTSD (see 3.1). The subject also returned to work in similar conditions as those in which the accident had occurred. It appeared, however, that the witnessing of hit-and-run motor vehicle accidents may have been the most important factors that triggered the onset of PTSD. These events may have affected the subject's sense of trust in the world's benevolence.

This subject was the only one who experienced more severe intrusive symptoms than avoidance symptoms. The fact that this subject had never been exposed to previous trauma could explain this phenomenon. Due to the absence of previous trauma, it was assumed that denial mechanisms might not have developed to safeguard the victim against the intrusive images of trauma. It was assumed that the repetition-compulsion defence mechanisms (Horowitz, 1986; Kolb, 1987; Solomons, 1989) were still primarily operating in this individual.

7.4 Summary

The first two cases were a reflection of the typical subject in the acute PTSD group and the acute PTSD chronic group and the chronic PTSD group. These two subjects were each characterized by a history of trauma and an exposure to a catastrophic mine accident with subsequent severe injuries. The experience of additional stress factors seemed to have triggered the onset of delayed PTSD. These two cases supported the stress vulnerability perspective (Selye, 1976).

The third case proved that exposure to other severe stress factors could precipitate previously absent PTSD symptoms in an individual not highly predisposed. In this case the stress vulnerability perspective was also supported.

The exaggerated startle response was the only PTSD symptom experienced at extreme levels of severity by all these subjects. This result was congruent with the high prevalence and severity of this symptom in the acute PTSD group, the acute PTSD chronic group and the chronic PTSD group. It may therefore support suggestions that startle response may be a trait marker of PTSD (Orr et al., 1995; Shalev and Rogel-Fuchs, 1993) and that it is be among the cardinal features of PTSD (APA, 1994).

Although not very prevalent in this sample, these results verified the validity of the diagnosis of PTSD with delayed onset in mine employees exposed to earth-fall accidents. Delayed onset PTSD can however be diagnosed many years after the precipitating traumatic event (APA, 1994). This delayed onset PTSD group therefore only represents a proportion of subjects who may still potentially develop delayed onset PTSD.

8. SUMMARY

The following groups were identified, compared and described in this study:

- The acute PTSD group (N=33), which comprised subjects with acute PTSD at the first assessment session.
- The acute PTSD chronic group (N=12), which comprised subjects who had acute PTSD during the first assessment and who had chronic PTSD during the second assessment session.
- The acute PTSD in-remission group (N=18), which comprised subjects with acute PTSD during the first assessment and whose symptoms remitted during the second assessment session.
- The primary acute PTSD group (N=13), which comprised subjects who had a history of PTSD and who developed primary (reactivated) PTSD by the first assessment as a result of the earth-fall accidents.
- The new acute PTSD group (N=20), who had acute PTSD for the first time at the first assessment session.
- The chronic PTSD group (N=16), who had chronic PTSD at the first assessment session.
- The delayed onset PTSD group (N=3), who had only developed PTSD by the second assessment session.
- The non-PTSD group (N=121), who did not have PTSD at either assessment sessions.

When the results are summarized, it appears that certain modulating, precipitating and predisposing factors in the pathogenesis of PTSD tended to increase the vulnerability of the development of acute and chronic PTSD. The results of chapter 8 also indicated that the course and severity of the PTSD symptoms, the comorbid disorders and the associated symptoms tended to differ

according to the types of PTSD, namely, acute PTSD, primary acute PTSD (reactivated PTSD), and chronic PTSD.

The results of the above groups - which have previously been summarized (see paragraphs 3.5; 4.6; 5.7; 6.2; 7.4) - are therefore integrated, summarized and discussed in terms of i) the profile of mine employees with acute PTSD, ii) the profile of mine employees with primary PTSD (reactivated), iii) the profile of mine employees with chronic PTSD, and iv) the profile of mine employees with delayed onset PTSD.

The profiles are subsequently presented in terms of their modulating factors, stress factors, predisposing factors, the severity of symptoms, cluster B symptoms, cluster C symptoms, cluster D symptoms, comorbid disorders, and associated symptoms.

1. Profile of mine employees with acute PTSD

Modulating factors which increased the risk:

- being unmarried;
- having less mining experience;
- being younger;
- being non-sotho (subjects who were therefore not part of the major ethnic group of the region);
- being first-born males;
- being employment as a mining assistant;
- having a level of education higher than standard 6.

Stress factors which increased the risk:

- A history of premorbid traumatic exposure increased the risk of developing acute PTSD.
- The severity of the precipitating earth-fall events increased the risk for acute PTSD. It was a better predictor for acute PTSD than the history of exposure to premorbid traumatic events.
- Being injured.
- The severity of premorbid enduring stressors.
- The exposure to other premorbid stressors.

Predisposing factors which increased the risk:

- A family history of psychiatric disease.
- A personal history of psychiatric disease, especially PTSD and major depressive disorder.

Severity of DSM-IV PTSD symptoms:

- Avoidance symptoms were more prevalent than intrusive symptoms in subjects with acute PTSD.
- Subjects with acute PTSD experienced cluster B, cluster C, and cluster D symptoms significantly more than did subjects without PTSD.
- Subjects with acute PTSD experienced significant functional deterioration.

DSM-IV PTSD cluster B symptoms:

- Re-experiencing symptoms did not appear specific but were sensitive to acute PTSD.

DSM-IV PTSD cluster C symptoms:

- Avoidance and numbing of general responsiveness were sensitive and specific to subjects with acute PTSD.

DSM-IV PTSD cluster D symptoms:

- Symptoms of hyperarousal were specific but not as sensitive to subjects with acute PTSD.

Comorbid disorders:

- Subjects with acute PTSD were more liable to develop generalized anxiety disorder and major depressive disorder than subjects without PTSD.
- The anxiety symptoms of subjects with acute PTSD were more psychological than somatic.
- Substance abuse was not a complicating factor in subjects with acute PTSD.
- Comorbid anxiety and depressive disorders remitted when the acute PTSD disorder remitted.

Associated symptoms:

- Subjects with acute PTSD were more vulnerable to develop associated symptoms than to subjects without PTSD.
- The associated symptoms were less severe and prevalent than the PTSD symptoms in subjects with acute PTSD.
- Subjects with acute PTSD were more likely to experience culturally related symptoms than subjects without PTSD.
- The low prevalence of culturally related symptoms in subjects with acute PTSD and without PTSD indicated a process of acculturation.

2. Profile of mine employees with chronic PTSD

Modulating factors which increased the risk:

- Living in a nucleus family arrangement.
- Not supporting an extended family financially.

Stress factors which increased the risk:

- A history of at least one previous trauma event increased the risk of chronic PTSD. On the other hand, the more the subjects were exposed to previous traumatic events the less likely they were to develop chronic PTSD. Therefore subjects with more than two premorbid traumatic exposures seemed to be at less risk than to subjects with only one premorbid traumatic event to develop chronic PTSD.
- The severity of the earth-fall events.
- The severity of enduring stress factors.
- The exposure to other premorbid stressors.

Predisposing factors which increased the risk:

- None were found.

PTSD symptoms during the acute phase of subjects who developed chronic PTSD:

Severity of DSM-IV PTSD symptoms:

- The PTSD symptoms of subjects with acute PTSD who developed chronic PTSD were more severe than the symptoms of subjects with acute PTSD who did not develop chronic PTSD.

DSM-IV PTSD cluster B symptoms:

- Subjects who developed chronic PTSD could not be differentiated from subjects whose symptoms remitted in terms of the cluster B DSM-IV PTSD symptoms during the acute phase of PTSD.

DSM-IV PTSD cluster C symptoms:

- Subjects that developed chronic PTSD seemed more likely to experience psychogenic amnesia and symptoms of estrangement and detachment during the acute phase than subjects with acute PTSD whose symptoms remitted.

DSM-IV PTSD cluster D symptoms:

- Subjects who developed chronic PTSD appeared more likely to experience exaggerated startle response during the acute phase than subjects with acute PTSD whose symptoms remitted.

PTSD symptoms during the chronic phase of subjects who developed chronic PTSD:**Severity of DSM-IV PTSD symptoms:**

- The PTSD symptoms of the subjects with chronic PTSD were more severe during the chronic phase than during the acute phase of the syndrome.
- The impairment of functioning of the subjects with chronic PTSD was more severe during the chronic phase than during the acute phase (the symptoms were therefore more severe during the chronic phase).

DSM-IV PTSD cluster B symptoms:

- Re-experiencing symptoms were very consistent over a period of seven months.
- Re-experiencing symptoms seemed to be sensitive, but not very specific to chronic PTSD.

DSM-IV PTSD cluster C symptoms:

- Subjects whose symptoms became chronic consistently experienced cluster C PTSD symptoms.
- Avoidance of thoughts, feelings and conversations and avoidance of activities, places and people as well as symptoms of restricted affect, seemed sensitive as well as specific to subjects with chronic PTSD.
- Avoidance symptoms and numbing of general responsiveness tended to be more pronounced in subjects with chronic PTSD than in subjects with acute PTSD.

DSM-IV PTSD cluster D symptoms:

- Symptoms of hyperarousal were consistently experienced by the majority of the subjects whose symptoms became chronic.
- The "increased hypervigilance" and "exaggerated startle response" symptoms tended to become more prevalent over a seven-month period.
- Subjects with chronic PTSD were more vulnerable to experience the exaggerated startle response than subjects with acute PTSD.

Comorbid disorders:***Comorbid disorders during the acute phase of subjects who developed chronic PTSD:***

- Subjects with acute PTSD who developed chronic PTSD were more likely to develop comorbid anxiety disorder as well as major depressive disorder during the acute phase than subjects with acute PTSD whose symptoms remitted.
- The anxiety symptoms of subjects who developed chronic PTSD were more psychological than somatic during the acute phase of the syndrome.

Comorbid disorders during the chronic phase of subjects who developed chronic PTSD

- The anxiety and depressive symptoms became more incapacitating as the PTSD became chronic.
- Subjects with comorbid anxiety disorder and major depressive disorder who developed chronic PTSD, continued to experience comorbid anxiety disorder as well as major depressive disorder.
- Depressive disorder appeared to be more prevalent during the chronic phase of PTSD.
- Comorbid anxiety disorders appeared more prevalent than major depressive disorder in subjects who developed chronic PTSD.
- The anxiety remained psychological of nature during the chronic phase of the PTSD.
- Subjects with chronic PTSD were more vulnerable to comorbid major depressive disorder than subjects with acute PTSD.

Associated symptoms:

Associated symptoms during the acute phase of subjects who developed chronic PTSD:

- Subjects with acute PTSD who displayed a loss of faith in core beliefs that which created a sense of meaning, seemed to be more vulnerable to chronic PTSD.
- Subjects with acute PTSD that felt as if they were going crazy appeared more liable to develop chronic PTSD.
- Subjects with acute PTSD who experienced cultural related symptoms appeared more vulnerable to chronic PTSD.

Associated symptoms during the chronic phase of subjects who developed chronic

PTSD:

- Subjects with chronic PTSD presented more associated symptoms than subjects with acute PTSD did.
- Feelings that nobody understands, of hopelessness, feeling ashamed, and spending time wondering why these events had happened to you and why only to you were consistently experienced by the majority of subjects whose symptoms became chronic.
- The symptom presentation seemed to indicate that the subjects with chronic PTSD experienced impairment of interpersonal relationships and possible personality change.
- Symptoms of bewitchment appeared to be an indicator of cultural adherence rather than an indicator of trauma impact.

3. Profile of mine employees with primary (reactivated) PTSD

Pathogenic factors:

- Subjects with primary PTSD differed from the other PTSD sub-groups in terms of the pathogenesis, mainly because of a premorbid history of PTSD.

Severity of DSM-IV PTSD symptoms:

- The PTSD symptoms of subjects with reactivated PTSD were more severe than those of subjects experiencing PTSD for the first time.

DSM-IV PTSD cluster B symptoms:

- Distressing dreams was the only cluster B symptom that appeared to be experienced more by subjects with reactivated PTSD than subjects experiencing PTSD for the first time PTSD.

DSM-IV PTSD cluster C symptoms:

- Symptoms of detachment and estrangement were the only cluster C PTSD symptoms experienced more by subjects with reactivated PTSD than subjects experiencing PTSD for the first time.

DSM-IV PTSD cluster D symptoms:

- The cluster D symptoms appeared to be experienced more by subjects with reactivated PTSD, but none of these results were significant.

Comorbid disorder:

- Subjects with reactivated PTSD were more vulnerable for comorbid generalized anxiety disorder and major depressive disorder than subjects experiencing PTSD for the first time.

Associated symptoms:

- Differences were not significant between reactivated PTSD and acute PTSD being experienced for the first time.

4. Profile of mine employees with delayed onset PTSD

- Only three subjects were identified with delayed onset PTSD. In all cases the PTSD was precipitated by exposure to additional stress.
- The exaggerated startle response was the only PTSD symptom that was extremely severe in all cases.
- The small size of this group restricted further interpretation and generalization of the results.

These profiles indicate that the modulating factors, namely marital status, employment experience, high risk nature of employment (employment as a mining assistant) and age - as in the many other studies previously mentioned - were

important factors in the pathogenesis of acute PTSD in mine employees involved in earth-fall accidents. Ethnic status, position in the family (being a first-born male) and being better educated were also found to be etiologically associated with acute PTSD in mine employees involved in earth-fall mine accidents. Acculturation factors, namely, family arrangement (living in a nucleus family setting) and support of an extended family, were found to be the only modulating factors that played an etiological role in chronic PTSD.

The role of stress factors in the pathogenesis of acute and chronic PTSD was found to be similar to that in the many other reports previously mentioned. Exposure to premorbid trauma, severity of the traumatic event, injury, exposure and severity of premorbid enduring and other stressors, were all found to predispose subjects to acute and chronic PTSD. Severity of traumatic events was found to be more significant than the number of previous traumas experienced in precipitating acute PTSD. Although the number of exposures to previous trauma appeared to increase the risk of acute PTSD, it appeared that psychological factors such as inoculation and stress resolution could occur in some subjects the more they were involved in traumatic events.

A family history and a personal history of psychiatric illness were found to be associated with acute PTSD but not with chronic PTSD. Modulating and stress factors therefore appeared to be more important in the pathogenesis of PTSD.

The profiles indicate that PTSD symptoms were more severe in subjects with reactivated PTSD, in subjects who were going to develop chronic PTSD (subjects with acute PTSD who developed chronic PTSD) and in subjects with chronic PTSD. It also appeared that avoidance symptoms (cluster C) were more prevalent than re-experiencing symptoms (cluster B) in subjects with acute PTSD.

Cluster B symptoms appeared sensitive but not specific to both acute and chronic PTSD. The re-experiencing symptoms also appeared consistent over a period of seven months in subjects who developed chronic PTSD. Distressing dreams appeared to differentiate subjects with reactivated PTSD from subjects experiencing PTSD for the first time.

Cluster C symptoms appeared sensitive and specific to subjects with both acute and chronic PTSD. Cluster C symptoms were consistently experienced over a period of seven months in subjects who developed chronic PTSD. Symptoms of detachment and estrangement appeared to differentiate subjects with reactivated PTSD or subjects that would develop chronic PTSD, from subjects with acute PTSD during the acute phase of the syndrome. Avoidance symptoms and numbing of general responsiveness tended to be more pronounced in subjects with chronic PTSD than in subjects with acute PTSD.

Cluster D symptoms were very specific but not as sensitive to subjects with acute and chronic PTSD. Cluster D symptoms were consistently experienced over a period of seven months in subjects who developed chronic PTSD. The exaggerated startle response symptom appeared to be a marker for chronic PTSD. It was more prevalent in subjects with acute PTSD who were going to develop chronic PTSD during the acute phase of the syndrome than in subjects with acute PTSD who did not develop chronic PTSD. The exaggerated startle response symptom was also more prevalent in chronic PTSD subjects than in acute PTSD subjects. It also became more prevalent over a period of seven months in subjects who developed chronic PTSD. The exaggerated startle response was also the only PTSD symptom that was experienced at extreme levels of severity by all subjects with delayed onset PTSD.

The profiles show that comorbid anxiety disorder and comorbid major depressive disorder were more prevalent in subjects with reactivated PTSD, as well as in subjects with chronic PTSD, than in subjects with acute PTSD. Comorbid anxiety and depression also appeared to be more prevalent during the acute phase of PTSD in subjects who eventually developed chronic PTSD, than in subjects with acute PTSD who did not develop chronic PTSD. Comorbid anxiety disorder was more prevalent than comorbid depressive disorder in the whole spectrum of the PTSD syndrome. The quality of the comorbid anxiety was psychological of nature throughout the whole spectrum of the PTSD syndrome of the sample studied.

Subjects with acute PTSD who experienced associated symptoms related to loss of trust, loss in core beliefs that created a sense of meaning, seemed to be more likely to develop chronic PTSD. Although not many subjects experienced culturally related symptoms, it appeared that those who did were more likely to develop chronic PTSD. Culturally related symptoms, however, did not increase when the PTSD became chronic - therefore indicating these symptoms to be rather an indicator of cultural adherence than an indicator of trauma impact in subjects with chronic PTSD.

PTSD with delayed onset was found in only three subjects. Due to the small size of this group interpretations about trends were not possible. The small sizes of the other PTSD subgroups unfortunately also influenced the interpretation of the results of this research project.

9. CONCLUSION

According to the results of this study, it appears that the researcher has fulfilled the objective of the study, as explained in chapter 1, namely, to investigate:

1. the character of the signs and symptoms of PTSD in mine employees in terms of the criteria of the Fourth Edition of the Diagnostic and Statistical Manual of Mental disorders (DSM-IV) for PTSD (APA, 1994); and
2. the pathogenesis of PTSD in the mineworker.

CHAPTER 9: RECOMMENDATION

In view of the problem stated in chapter 1 and the results of this study, the following suggestions are made (Figure 4).

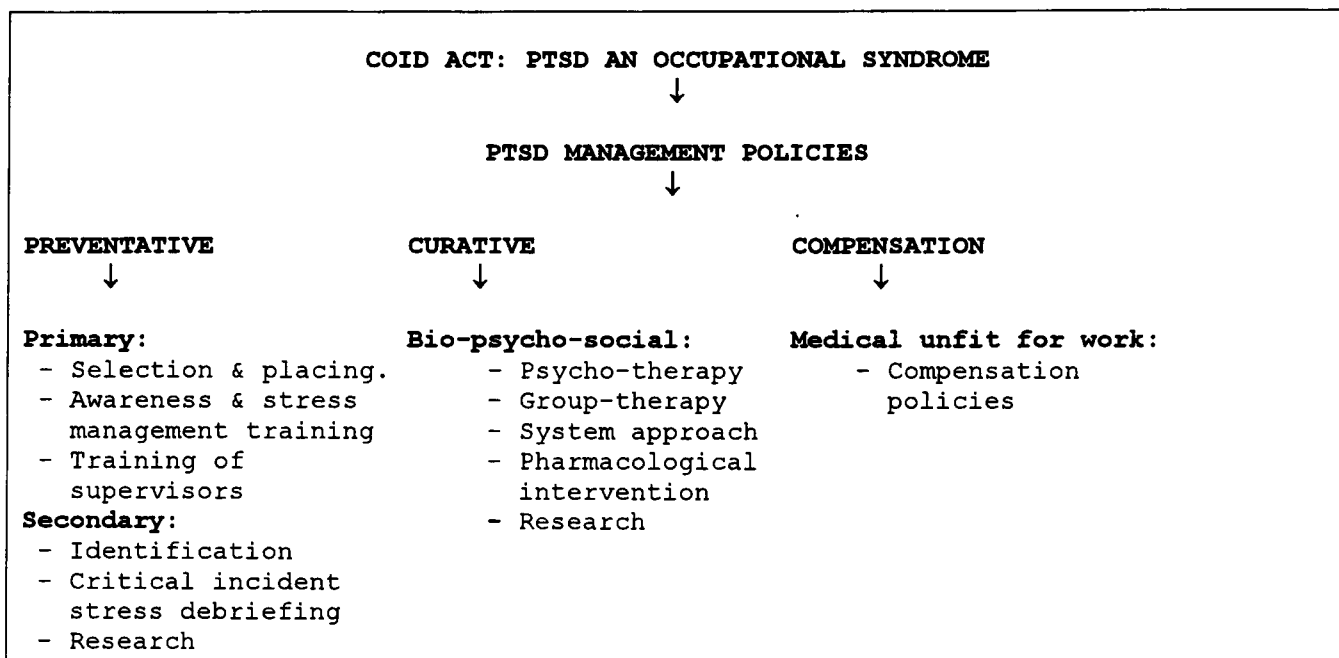


Figure 4 Management of PTSD

PTSD should be legislated as a valid occupational syndrome in the Compensation for Occupational Injuries and Diseases (COID) Act. South African gold mines should, as a result of the inclusion of PTSD in the COID act, develop and implement policies and procedures for the management of PTSD. The management of PTSD should include preventative, curative and compensation policies and procedures.

Preventative programs should be on a primary and secondary level. Primary prevention should include policies on the selection and placing of employees and policies on awareness training and management of traumatic stress. Policies on training programs for supervisors in the identification of troubled employees and

the correct referral procedures to refer traumatized individuals should be developed. The results of this study indicated that factors such as a personal history of exposure to trauma and injuries should be used in the development of selection and placing procedures. Results regarding the symptoms and signs of PTSD in the subjects of this study would be very valuable in the development of awareness and training programs for supervisors.

Secondary prevention refers to the early **identification** of illness and the implementation of **critical incident stress debriefing** (CISD) as soon as possible after a traumatic event.

Quick identification of emotionally upset persons following exposure to a trauma depends upon the observer's familiarity with the key signs and symptoms of PTSD. All mine accidents are followed by an accident report. The accident report usually includes the names of all the witnesses and victims of the traumatic experience. All these individuals should be identified and referred for preventative intervention as soon as possible following the traumatic event. A trained counsellor should then conduct CISD on all these referred employees. The results of this study indicated that exposure to certain events should always result in referral of CISD, for example, a history of exposure to accidents, being pinned by rocks, being injured, experiencing lack of light and experiencing suffocation during the traumatic earth-fall accident.

CISD is a process of secondary prevention but also fulfils a primary function. It is the most common form of preventative measures taken by organizations after critical incidents. The knowledge of occurrences of a traumatic incident makes it ethically inexcusable for organizations not to identify the victims and witnesses for referral to debriefing.

Organizations with a high potential for trauma, such as the mining industry, need a strong response capability for employee assistance as well as to compensate for the absence of a social support system (Easton, 1988). Extensive pre-employment evaluations to select capable people for a stressful occupation, and training in emotional response to trauma for all employees in high-risk occupations, is becoming a way of doing business. Organizations have a responsibility to help identify and eliminate stress problems that are predictable within their work environment. In settings where trauma is unavoidable, programs and procedures should be in place to deal with the immediate effects of the trauma (Williams, 1993). However, ongoing research into the effectiveness of the different preventative actions is necessary, especially as regards the effect on safety, production and motivation of employees.

Policies, based on the COID Act, should be developed in terms of the availability of curative services when traumatized employees developed PTSD. The results of this study have provided valuable information on the profile of subjects who were most likely to develop acute and chronic PTSD. This information could be used to develop screening procedures, that should be followed up over time, for individuals involved in trauma. Treatment may include psychotherapy, group therapy, a systems approach in which employees may be transferred to different working environments, and medication. However, research on the effectiveness of the different methods of therapeutic intervention is essential. The results of this study have also shown the need for more focussed research, for example, investigations into the exaggerated startle response and prognosis.

PTSD may render some victims unfit to return to work. A procedural policy could be very beneficial for the management of such employees. The procedures that should be followed to determine compensation for PTSD should be clarified. They should be relevant to the occupational circumstances. The levels of disability in

relation to compensation benefits need to be specified. More research in this regard is indicated. The results of this study have provided facts (for example, at risk employees, profiles that could assist in identifying malingerers) to assist in the development of compensation policies.

The following benefits are envisaged if the above recommendations on the management of PTSD are implemented:

- Legislation of PTSD in the COID Act would ensure development of policies and implementation thereof.
- Possible PTSD might be prevented in trauma victims.
- Victims would experience management support.
- Victims would probably develop positive attitudes about their employers.
- The presence of psychiatrically ill employees in the workplace would be obviated and limited with subsequent improved safety standards and higher production.
- Victims could enjoy the option of compensation if found unfit for work.
- Non-traumatized employees would witness the support of management to traumatized colleagues and this could positively influence attitudes, motivation and production.
- Non-traumatized employees would benefit from a safer environment because the subjects with PTSD and depression are more liable to be accident-prone.
- The employer would experience better control over employees involved in trauma.
- The employer would have a proactive plan to manage the emotional sequelae of traumatized employees.
- Production would increase as a result of positive morale in employees and a safer work environment.

- Compensation policies would prevent employment of non-productive employees and the long-term cost this could entail.
- Mental health professionals would be able to effectively manage traumatized employees, and know whether to treat, transfer or recommend medical unfitness.
- The effective treatment of subjects would positively influence morale, production and reduce costs.
- The mental health sciences would experience a stimulation and encouragement to research trauma-related matters as a result of legislation regarding PTSD.
- Research would eventually ensure effective prevention and management of PTSD.

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RÉSUMÉ

Aim: The aim of the study was to investigate:

1. the character of the signs and symptoms of Posttraumatic stress disorder (PTSD) in mine employees in terms of the criteria of the Fourth Edition of the Diagnostic and Statistical Manual of Mental disorders (DSM-IV) for PTSD; and
2. the pathogenesis of PTSD in the mineworker.

Empirical investigation: It was a prospective follow-up study. Two hundred employees of a mine in the Free State goldfields who were involved in earth-fall accidents were identified and followed up for two assessment sessions over a period of seven months to determine the development of illness.

Subjects: Four subgroups were identified from this sample. They were 1) the chronic PTSD group (N=16) who already had chronic PTSD, as a result of previous trauma, at the first assessment session; 2) the acute PTSD group (N=33) who developed acute PTSD at the first assessment session; 3) the delayed onset PTSD group (N=3) comprising subjects who developed PTSD with delayed onset at the second assessment session; and 4) the non-PTSD group (N=121) who never developed PTSD. Nineteen subjects could not be found at the first assessment session and were not included in the research project.

Results: Modulating factors, namely, age, marital status, employment experience, high-risk nature of employment, ethnic status, position in the family (being a first-born male), being better educated, living in a nucleus family setting and supporting an extended family, were found to be etiologically associated with PTSD.

Stress factors, namely, exposures to premorbid trauma, severity of the traumatic event, injury, premorbid exposure to other stressors were found to predispose subjects to acute and chronic PTSD. Severity of traumatic events was found to be more significant than the number of previous traumas experienced in precipitating acute PTSD.

A family history and a personal history of psychiatric illness were found to be etiologically associated with acute PTSD, but not with chronic PTSD.

PTSD symptoms were more severe in subjects with reactivated PTSD, in subjects with acute PTSD who were at risk to chronic PTSD, and in subjects with chronic PTSD than in subjects with acute PTSD whose symptoms remitted.

Re-experiencing symptoms appeared sensitive, but not specific, for acute and chronic PTSD. Distressing dreams appeared to distinguish subjects with reactivated PTSD from subjects experiencing PTSD for the first time.

Avoidance symptoms and numbing of general responsiveness appeared sensitive and specific for acute PTSD and chronic PTSD. Symptoms of detachment and estrangement appeared to distinguish subjects with reactivated PTSD and subjects who were at risk to chronic PTSD, from first time acute PTSD subjects who were not at risk of developing chronic PTSD. Avoidance symptoms and numbing of general responsiveness tended to be more pronounced in subjects with chronic PTSD than in subjects with acute PTSD.

Symptoms of hyperarousal were very specific but not as sensitive for acute PTSD and chronic PTSD. The exaggerated startle response symptom appeared to be a marker for chronic PTSD. The exaggerated startle response was also the only PTSD

symptom that was experienced at extreme levels of severity by all the subjects with delayed onset PTSD.

Comorbid anxiety disorder and comorbid major depressive disorder were more prevalent in subjects with reactivated PTSD and in subjects with chronic PTSD than in subjects with acute PTSD. Comorbid anxiety and depression were more prevalent in subjects with acute PTSD who were at risk of developing chronic PTSD than in subjects with acute PTSD who did not develop chronic PTSD. Comorbid anxiety disorders were more prevalent than comorbid depressive disorders in the whole spectrum of the PTSD syndrome.

Subjects with acute PTSD who experienced loss of trust and loss in core beliefs that created a sense of meaning, seemed vulnerable to develop chronic PTSD. Subjects who experienced culturally related symptoms appeared more liable to develop chronic PTSD than those who did not.

Conclusion: These results have provided data on which profiles for mine employees with acute PTSD, chronic PTSD and PTSD with delayed onset could be drawn. As a result suggestions were made about the legislation of PTSD as an occupational syndrome, and by the same token, the development and implementation of policies and procedures for the management of PTSD in industries.

Key terms: Posttraumatic stress; stress; trauma; mine accidents; earth-falls; mines; goldmines; mineworkers.

RÉSUMÉ

Doel: Die doel van die studie was om:

1. die aard van die simptome en tekens van posttraumatische stresversteuring (PTSV) by mynwerkers in terme van die PTSV kriteria van die "Fourth Edition of the Diagnostic and Statistical Manual of Mental disorders" (DSM-IV) te ondersoek; en om
2. die patogenese van PTSV by mynwerkers te ondersoek.

Empiriese ondersoek: Dit was 'n prospektiewe opvolg-studie. Twee-honderd werknemers van 'n myn in die Vrystaatse goudvelde wat in rotsstortingsongelukke betrokke was, was geïdentifiseer. Hulle was vir twee evaluasie-sessies oor 'n tydperk van sewe maande opgevolg, om die ontwikkeling van versteurings vas te stel.

Proefpersone: Vier subgroepe is uit hierdie steekproef geïdentifiseer. Hulle was 1) die kroniese PTSV groep (N=16) wat alreeds, weens vorige trauma, aan kroniese PTSV gely het tydens die eerste evaluasie-sessie; 2) die akute PTSV groep (N=33) wat akute PTSV ontwikkel het met die eerste evaluasie-sessie; 3) die PTSV-met-vertraagde-aanvang groep (N=3) bestaande uit proefpersone wat PTSV met vertraagde aanvang ontwikkel het met die tweede evaluasie-sessie; en 4) die nie-PTSV groep (N=121) wat nooit PTSV ontwikkel het nie. Negentien proefpersone kon nie tydens die eerste evaluasie-sessie gevind word nie, en was nie by die ondersoek ingesluit nie.

Resultate: Modulerende faktore, naamlik: ouderdom, huwelikstatus, werknemerservaring, hoë-risiko beroep, etniese status, plek in die gesin (om 'n eersgebore seun te wees), hoër vlak van akademiese opvoeding, om in 'n kern-

gesinsopset te leef en om 'n uitgebreide gesin finansieel te ondersteun, het etiologies verband gehou met PTSV.

Daar is gevind dat stresfaktore soos, blootstelling aan premorbiede trauma, erns van die traumatiese insident, beserings en premorbiede blootstelling aan ander stresfaktore, akute en kroniese PTSV by die proefpersone predisponer het. Die erns van traumatiese gebeure was meer betekenisvol in die sneller van akute PTSV as die hoeveelheid vorige traumas.

'n Familie geskiedenis en 'n persoonlike geskiedenis van psigiatriese siektes het etiologies met akute PTSV verband gehou, maar nie met kroniese PTSV nie.

PTSV simptome was erger in proefpersone met geheraktiveerde PTSV, in proefpersone met akute PTSV wat vatbaar was vir kroniese PTSV, en in proefpersone met kroniese PTSV, as in proefpersone met akute PTSD wie se simptome in remissie gegaan het.

Die herbelewenis simptome het sensitief, maar nie spesifiek nie, vir akute PTSV en kroniese PTSV voorgekom. Dit het geblyk of ontstellende drome proefpersone met geheraktiveerde PTSV van proefpersone wat PTSV vir die eerste keer ontwikkel het, onderskei.

Simptome van vermyding en afstomping van algemene responsiwiteit het sensitief en spesifiek vir akute PTSV en kroniese PTSV voorgekom. Dit het voorgekom of simptome van afsondering en vervreemding proefpersone met geheraktiveerde PTSV en proefpersone wat vatbaar was vir kroniese PTSV, van proefpersone met akute PTSV wat nie vir kroniese PTSV vatbaar was nie, onderskei. Simptome van vermyding en afstomping van algemene responsiwiteit het geneig om sterker in proefpersone met kroniese PTSV as in proefpersone met akute PTSV te wees.

Simptome van verhoogde opwekking was baie spesifiek, maar nie sensitief nie, vir akute PTSV en kroniese PTSV. Dit het voorgekom dat die verhoogde skrikreaksie simptome 'n merker vir kroniese PTSV is. Die verhoogde skrikreaksie simptome was ook die enigste simptome waarvan die graad van erns by al die proefpersone met PTSV met vertraagde aanvang, ekstreem was.

Komorbiede angstersteuring en komorbiede major depressiewe versteuring was meer algemeen in proefpersone met geheraktiveerde PTSV en proefpersone met kroniese PTSV as in proefpersone met akute PTSV. Komorbiede angst en depressie was meer algemeen in proefpersone met akute PTSV wat vatbaar was vir kroniese PTSV, as in proefpersone met akute PTSV wat nie kroniese PTSV ontwikkel het nie. Komorbiede angstersteurings was oor die hele spektrum van die PTSV sindroom meer algemeen as komorbiede depressiewe versteurings.

Dit het voorgekom of proefpersone met akute PTSV wat 'n verlies aan vertroue en 'n verlies aan kernwaardes, wat 'n sin van betekenis skep, ervaar het, vatbaar was om kroniese PTSV te ontwikkel. Dit het geblyk of proefpersone wat kultuurverwante simptome ervaar het, meer geneig was om kroniese PTSV te ontwikkel as proefpersone wat dit nie ervaar het nie.

Gevolgtrekking: Hierdie resultate het data voorsien waarvan profiele, vir mynwerkers met akute PTSV, kroniese PTSV en PTSV met vertraagde aanvang, ontwikkel kon word. Gevolglik is aanbevelings in terme van wetgewing ten opsigte van PTSV as 'n beroepsiekte gemaak, met gevolglike aanbevelings ten opsigte van die ontwikkeling en implementering van beleid en prosedures ten opsigte van die bestuur van PTSV in nywerhede.