THE INDIVIDUAL FACTORS RELATED TO UNSAFE BEHAVIOUR OF CONSTRUCTION WORKERS

by

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SUMMARY

The concerning high occurrence of construction accidents is experienced worldwide and the cost implications are far-reaching. South African construction is not exempt from this issue and in terms of South African legislation, both physical and psychological fitness are required to manage worker safety behaviour in construction. The required psychological fitness levels of construction workers and the factors within the workers themselves influence worker safety behaviour and was the focus of this study. A non-empirical, qualitative research design was used to synthesise a framework of the specific individual factors which could influence a worker's sound state of mind by means of a systematic literature review and interviews with subject matter experts and supervisors of construction workers. The individual factors were divided into four categories which were conceptualised from the theory, namely knowledge and experience factors, perceptions and mindsets, attitudes and motivations and, finally, personality characteristics. Each factor was investigated and conceptualised in terms of its impact on the safety behaviour of workers. The analysis of data from the interview presented three main themes, namely individual factors (which pertain to the workers themselves), factors related to the supervisor and, finally, external factors present in the environment. All the factors were included in the framework within the different categories, highlighting the factors related to the interviews and the literature review individually.

CHAPTER 1: INTRODUCTION AND AIM

1.1 INTRODUCTION

In South Africa, one in six work-related fatal accidents occur on construction sites (Construction Industry Development Board, 2009:1). This rate increases each year, as indicated in statistics provided by the Department of Labour, which indicate a significant rise in accidents to around 160 fatalities and around 400 non-fatal accidents for the period 2004 to 2008 (Construction Industry Development Board, 2009:2).

The concerning high occurrence of construction accidents is experienced worldwide, as is evidenced by the global health and safety statistics, which state there is one fatal accident every ten minutes (Construction Industry Development Board, 2009:4). In industrialised countries, 25% to 40% of work-related deaths occur on construction sites, despite the sector only employing six to ten per cent of the total workforce (Construction Industry Development Board, 2008:2). Further, the accident, injury and fatality rates in construction are higher than those of most other industries (Carter & Smith, 2006:199; Choudhry, Fang & Ahmed, 2008:24; Hinze 1997:105; Kines, Spangenberg & Dyreborg, 2007:54; Mthalane, Othman & Pearl, 2008:2; Sawacha, Fong & Naoum, 1999:310).

Loss of life, albeit a very unfortunate and serious consequence of construction accidents, is not the only concern facing the industry. Construction accidents are costly (Al-Humaidi & Tan, 2010:70). In the South African building and construction industry alone, the statistics for 2011 revealed that 6 800 incidents recorded of which 42 were fatalities and 180 resulted in disabilities. Days lost due to injuries amounted to 20 000 and the total cost to the industry was in excess of R300 million (Specifier, 2012). There are direct and indirect costs related to accidents. Direct costs include treatment for injuries, compensation due to injury and workmen's compensation. Indirect costs incurred by contractors include decreased productivity, clean-up, stand-by, administrative, rescheduling, transport and supervision costs, wages paid while the injured worker is out of action and orientation for the replacement worker (Gambatese & Hinze, 1999:645; Garret & Teizer, 2009:760; Zeng, Tam & Tam, 2010:47). These costs tend to become visible only as time passes and

therefore the contractor will not be aware of them when the accident first occurs (Germain, Bird & Labuschagne, 2011:136; Hinze, 2006:66). In the South African context, research has proved that indirect costs can be as much as 14 times the direct costs (Smallwood, 2000:26). The impact of the invisible loss can be illustrated as an iceberg, as can be seen in Figure 1.

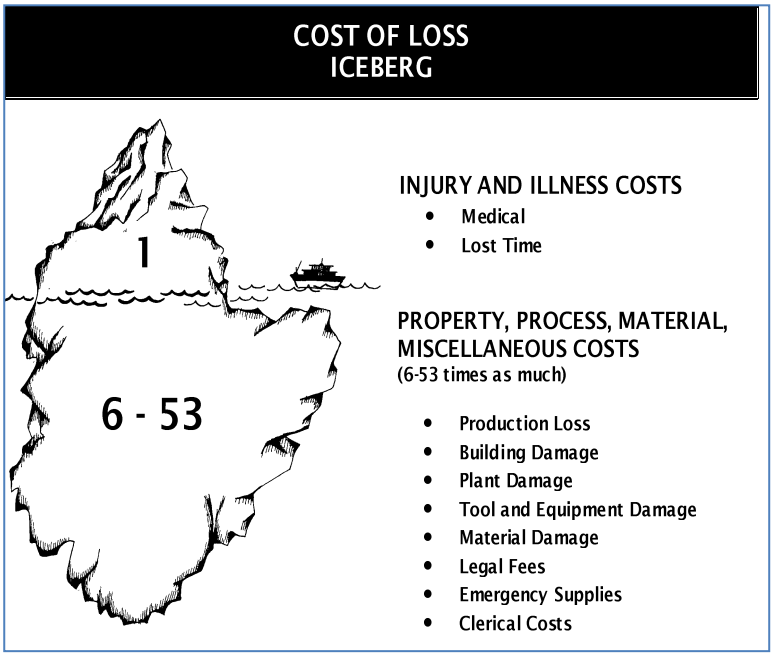

Figure 1: Hidden costs

Source: Germain *et al.* (2011:136)

South African construction companies have to adhere to Section 15(12)(a) of the amended Occupational Health and Safety Act (85/2003), which states, “A contractor shall ensure that all employees required to work or to be supported on a suspended platform are physically and psychologically fit to work safely in such an environment by being in possession of a medical certificate of fitness.”

The purpose of including psychological fitness in this Act was for the regulation of a potentially dangerous industry and to design a legal structure to regulate the level of health and safety for this industry (Deacon & Kew, 2006:50).

Construction accidents are increasing and with them, the costs to both the industry and government in terms of worker compensation and loss of productivity (Mthalane *et al.*,

2008:2). Legislation has been amended to address the issue and the industry needs to respond with its own research and plans to reduce accident rates. The current study was a response from academe to aid in addressing the issue.

1.2 THE PROBLEM STATEMENT

The rationale for this study was based on South African legislative implications for the construction industry. As mentioned before, South African construction companies have to adhere to Section 15(12)(a) of the amended Occupational Health and Safety Act (85/2003) by ensuring that their employees are not only physically, but also psychologically fit for work.

Psychological fitness differs from physical fitness, and a medical certificate does not provide assurances of both fitness types; it focuses only on the physical aspects (Bates Bowles, Burbelo, Fautua, Fritts, Hammer, Hammermeister, Moore, Myatt, Pinder, Rhodes, Stokes, Vythilingam, Westphal & Yosick, 2010:25). Superfluous psychological evaluation of a worker's psychological fitness is not the purpose of the amendment; the focus is more on determining whether a worker has a sound state of mind in accordance with his or her level of responsibility in the workplace (Deacon & Kew, 2006:49). Various factors could influence this state of mind and the worker's safety behaviour.

Following a recent South African study, which consisted of a comprehensive literature review regarding the various aspects which impact on psychological fitness, a definition for psychological fitness was conceptualised. Brand-Labuschagne (2010:181) proposed that psychological fitness is "a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely".

According to Mullen (2004:275), researchers have recently been considering that many workplace accidents and injuries can be ascribed to the unsafe behaviour of workers themselves rather than unsafe work environments, which links with amended legislation in terms of the importance of the physical and psychological fitness of construction workers. The importance of investigation into factors which could impact on the sound state of mind

of the workers themselves is emphasised when we investigate some of the most destructive accidents in human history. On 26 April 1986, a nuclear disaster occurred at the Chernobyl Nuclear Power Plant in the Ukraine. It is now known as the Chernobyl disaster, which is the only disaster classified as a level seven event on the International Nuclear Event Scale. According to Reason (1990:19), the cause of the accident was human error.

The primary focus of the academic literature on this topic has been processes of safety management regarding aspects such as the safety procedures and policies, management's responsibilities and roles regarding construction safety and adherence to safety measures, technological aspects and other factors in the external environment of the construction worker. These will be discussed in Chapter three.

It can therefore be determined that the worker's state of mind would influence the worker's behaviour and the aim of the study was on the individual factors which could negatively affect the state of mind and subsequent behaviour. Research into these factors has been limited, and in the interest of compliance with the relevant legislation and expanding the academic contribution, the factors which could affect the worker's state of mind and subsequent behaviour will be the main focus of this study.

1.3 PURPOSE OF THE STUDY

The study proposed to synthesise a framework for the specific individual factors which could influence a worker's sound state of mind through a systematic review of relevant literature and interviews with SMEs and supervisors. Throughout the study, these factors will be referred to as individual factors.

1.4 DELIMITATIONS

Several delimitations are evident in the study with regards to the background, the factors identified and the theoretical perspective.

The literature review for the study focused on both international and South African sources. As such, South African construction workers were not the main focus of the literature review, as literature on local construction is limited (Brand-Labuschagne, 2010:25; Mthalane *et al.*, 2008:2).

During the interviews with the supervisors of construction workers, it became evident that they were not able to identify the risk factors as they did not have the background or knowledge of psychological factors which may influence individual behaviour. The SMEs were able to identify some of the risk factors as found in the literature, as well as some external factors. All the factors identified from the literature and the interviews were included in the framework, in the interest of comprehensiveness.

1.5 ASSUMPTIONS

This study made certain assumptions about the construction industry, individual risk factors, SMEs and the South African context.

An assumption is “a thing that is accepted as true or as certain to happen, without proof” (Oxforddictionaries.com, Not dated). Several basic assumptions underlie the proposed research study. As such, it is assumed that:

- all construction workers display certain individual factors which govern how they act at work;
- these individual factors are recognisable in the various studies selected to help formulate the framework;
- individual factors directly impact safety behaviour on construction sites;
- the individual factors identified apply to South African construction workers;
- SMEs and supervisors on construction sites can identify the individual factors and will be willing to do so for the study;
- qualitative research is an appropriate means to explore this human phenomenon; and

- open-ended guided questions in interviews with supervisors and SMEs will be an effective method of obtaining their opinion regarding the relevance of the identified factors on South African construction sites.

1.6 CONCLUSION AND OVERVIEW OF THE STUDY

The study consisted of a systematic literature review to identify individual risk factors in construction workers and interviews conducted with SMEs and supervisors to obtain their input for individual factors, as well as their opinions on the relevance of the identified factors for South African construction workers in order to develop a framework on the topic. The research objectives that guided the study were as follows:

- to develop a framework of individual risk factors in construction workers based on a systematic review and synthesis of the academic literature available on this topic;
- to interview South African SMEs and supervisors of construction workers regarding the applicability of the identified individual risk factors based on their own extensive knowledge of the topic; and
- to synthesise a reliable, applicable framework for identifying individual risk factors in South African construction workers.

The rest of this document is organised as follows:

Chapter two addresses the topic of unsafe behaviour and investigates the relationship between worker behaviour and safety in the workplace and the impact of its interdependent nature on accident rates.

Chapters three and four have their own description of the research method used, as there are different aspects relating to the two techniques that have to be addressed individually in order to obtain a comprehensive idea of the research design.

Chapter three focuses on the systematic review of literature. This chapter contains the literature review and a discussion of the individual factors identified and their impact on

safety behaviour. First, the definitions of human or individual factors are explored and compared. From this, a definition of individual factors in relation to this study is synthesised. In the next section, the types of individual factors as described by the Health and Safety Executive are explored. After this, the individual factors identified from the literature are conceptualised with the use of a comparative summary in table format. Four categories are identified, namely knowledge and experience, perceptions and mindsets, attitudes and motivations and, lastly, personality characteristics. The categories and factors are explained in further detail and different definitions from various research studies are incorporated to describe the different individual factors. Finally, each factor is expanded on in terms of its relationship to unsafe behaviour and the subsequent impact on accident rates.

Chapter four focuses on the research methodology for the interviews. Aspects which are addressed include a description of qualitative research, the rationale for selecting this method for the study, as well as advantages, disadvantages and assumptions in qualitative research. The chapter also addresses grounded theory as an approach and the steps used in the process to obtain the various findings. A description of the inquiry strategy and the broad research design is provided, along with the phases of the research process. Finally, the method of data analysis is discussed.

Chapter five focuses on the ethical considerations for the study. It is added as a chapter to emphasise the importance of adhering to these considerations throughout the research design and the data analysis. The factors taken into account include the principles of justice, beneficence, respect for human dignity and the involvement of the researcher in the process. It serves as an introduction to the findings and a reminder of the principles adhered to throughout this study.

Chapter six focuses on the findings from interviews conducted and the individual factors identified by the interviewees through the use of ATLAS.ti as a qualitative tool. Extracts from the interviews are used to explain the themes and subthemes and the questions and answers which led to their formulation. From the interviews, the main themes identified are described as individual factors, factors relating to the supervisor's role and external factors. Hereafter, each subtheme is connected to the relevant sources which provide

empiric confirmation of the relevance of the identified factors. From the information gathered through the systematic literature review and the interviews, the framework is synthesised, discussed and added to the study. Finally, the study is concluded and suggestions for possible future research based on the findings of this study are made.

1.7 ABBREVIATIONS AND DEFINITIONS

Important information regarding abbreviations and key terms used in this study is provided in this section in Table 1. Additional definitions for the various individual factors will be provided in each category as the findings are presented.

Table 1: Abbreviations used in this study

Abbreviation	Meaning
HSE	Health and safety executive
ISO	International Organisation for Standardisation
OHSAS	Occupational Health and Safety Advisory Services
PPE	Proper precautionary equipment
S01	Supervisor number 1
S02	Supervisor number 2
S03	Supervisor number 3
SME	Subject matter expert
SME01	Subject matter expert number 1
SME02	Subject matter expert number 2
SME03	Subject matter expert number 3
SME04	Subject matter expert number 4

Unsafe behaviour: In relation to the construction industry, unsafe behaviour has been defined as “actions which have a high risk of being harmful or injurious to oneself or others” (Choudhry & Fang, 2008:566).

Construction worker: According to the Occupational Health and Safety Act, “construction work” means any work in connection with:

- the erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;
- the installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;
- the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or
- the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work.

Thus, in this study, a construction worker is someone who performs work which can be described by any and/or all of the above.

Psychological fitness has been defined as “a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely” (Brand-Labuschagne, 2010:181). This definition was constructed from various definitions to refer specifically to psychological fitness of construction workers and includes mental aspects, motivational aspects, behaviours, attitudes and traits.

The rest of the concepts are defined and described in the text as part of the literature review.

CHAPTER 2: THE IMPACT OF UNSAFE BEHAVIOUR ON OCCUPATIONAL HEALTH AND SAFETY

2.1 INTRODUCTION

Unsafe behaviour in the construction industry has a proved impact on occupational health and safety. Specific studies focused on relationships between the different individual factors and safety behaviour or attitudes and provided statistical evidence of the significant relationship between these factors and safety behaviour as will be discussed in section 3.4 of this study. In this chapter, the importance of this relationship and its impact on the study are reported.

2.2 OCCUPATIONAL HEALTH AND SAFETY STANDARDS IN SOUTH AFRICA

Occupational health and safety standards have to be adhered to in order for construction companies to ensure that they uphold a good reputation in the industry. In an interview conducted with SME01, on 2011-08-16, he mentioned that an increasing number of companies in the construction industry are realising the value of a low accident record and of complying with the industry standards for health and safety management.

Although the International Organisation for Standardisation quality standards (ISO 9000 and ISO 14001) are used in various countries as a framework for quality and environmental management, they do not apply to South African construction companies. In South Africa, the Occupational Health and Safety Advisory Services' occupational health and safety management standard (South African Bureau of Standards, 2008) is used as a recognised standard for certification and assessment. The OHSAS 18001 enables companies to comply with risk assessment and prevention requirements by addressing the following key areas:

- planning for hazard identification, risk assessment and risk control;
- OHSAS management programme;
- structure and responsibility for safety;

- training, awareness and competence;
- consultation and communication;
- operational control;
- emergency preparedness and response; and
- performance measuring, monitoring and improvement of safety measures.

By adhering to the OHSAS 18001 and meeting the required standards, construction companies can:

- establish an OHSAS management system to eliminate or minimise risk to employees and other parties who may be exposed to OHSAS risks associated with the various activities;
- assure itself of its conformance with its stated OHSAS policy;
- demonstrate such conformance to others;
- implement, maintain and continually improve an OHSAS management system;
- make a self-determination and declaration of conformance with this OHSAS specification; and
- seek certification/registration of its OHSAS management system by an external organisation.

The importance of low accident rates is made evident by standards such as those upheld by OHSAS 18001, because it influences compliance to industry standards, which in turn impacts on risk management and reputation in the industry. Individual factors in workers themselves play a big role in accident rates as found by the research for this study, which will be discussed in Chapter 3. Therefore, the identification of these factors is valuable to all involved in the construction industry who wish to adhere to industry standards of occupational health and safety.

2.3 UNSAFE BEHAVIOUR AS IDENTIFIED IN HUMAN ERROR THEORIES

This study was based on the principles of the human error theories which are described by behaviour and human factor models. Human error was originally defined as “any one set of human actions that exceed some limit of acceptability” (Rigby, 1970). Definitions and categorisations of human error have been researched extensively (Dejoy 1990:11; McClay, 1989:19; Norman, 1981:2; Petersen, 1982:3; Reason, 1990:19; Recht 1970:35; Rook, Altman & Swain, 1966). In the construction environment, human error plays a decisive role in accident rates and adherence to safety standards in terms of worker actions on the site (Abdelhamid & Everett, 2000:53; Arezes & Miguel, 2008:902; Cavazza & Serpe, 2009:279).

Behaviour models depict workers as the main contributors to accidents, because most behaviour models are based on the accident proneness theory, which assumes that certain people have characteristics which cause them to be more prone to accidents (Heinrich, 1995:135; Klumb 1995:1456; Reason, 1998:295). Many behaviour models were developed to explain why some people tend to be prone to accidents (Dwyer & Raftery, 1991:168; Friend & Khon, 1992:114; Heath, 1991:212; Hoyos & Zimolong, 1988; Kerr, 1957:5; Krause, Hidley & Lareau, 1984:21; Krause & Russell, 1994; Petersen, 1975:5; Wagenaar, Hudson & Reason, 1990:275). Various researchers have also tried to identify the specific individual characteristics which predispose certain individuals, rather than others, to be injured at work (Hansen, 1989:83; Sutherland & Cooper, 1991:196).

Accident proneness was first described by Greenwood and Woods (1919:119) who proposed that a certain group of workers was more likely to be involved in an accident at a single point in time and across numerous points in time than others. Further research attempted to determine the specific characteristics which distinguished the accident-prone group from the non-accident-prone group and to determine the relationships between specific characteristics and accident proneness (Shaw & Sichel, 1971:5).

Criticism of early research has been significant, relating to the definitions of accident proneness (Haddon, Suchman & Klein, 1964:81; Shaw & Sichel, 1971:5), the generalisation of the traits in different roles and settings and their consistency over time

(Adelstein, 1952:355; Arbous & Kerrich, 1951:342; Cohen & Margolis, 1973:603; Guilford, 1973:308; Mather, Kit, Bloch & Herman, 1970:3; Shaw & Sichel, 1971:5; Welford, 1958:15) and the assumptions of bi-variate relationships without controls set in place regarding the working environment and the use of self-reporting (Haddon *et al*., 1964:85; Hansen, 1989:85; McKenna, 1983:68; Sutherland & Cooper, 1991:200). More recent research focused on reducing and preventing accidents by improving the work and organisational environments, which achieved some success (Cox & Cox, 1996:16; Hale & Hovden, 1998:46).

In recent years, however, research on occupational accidents has shifted its focus back to the less technical or managerial aspects of the workplace, namely the individual factors of workers (Bea, 1998:114; Garret & Teizer, 2009; Henning, Stufft, Payne, Bergman, Mannan & Keren, 2009:337; Thevendran & Mawdesley, 2004:133), which was the focus of this study.

2.4 THE RELATIONSHIP BETWEEN UNSAFE BEHAVIOUR AND OCCUPATIONAL HEALTH AND SAFETY

The state of mind or mental health of workers has been linked to occupational health and safety and accident proneness (Defares, Brandjes, Naas & Ploeg, 1984:200), thus establishing the need to investigate factors which may cause workers to be psychologically unfit to perform construction work. Research in this area, while ambiguous, confirmed that individual characteristics play a mediating role in the relationship between individual factors in workers and occupational health and safety (Bea, 1998:114; Garret & Teizer, 2009; Henning, Stufft, Payne, Bergman, Mannan & Keren, 2009:337; Thevendran & Mawdesley, 2004:133).

The behaviour of different individuals is the key to identifying the individual factors which might influence workers to engage in unsafe acts at work. This behaviour influences the work environment and the safety culture upheld in the company (Lingard & Yesilyurt, 2003:60). Geller (2002) developed the safety triad model (Figure 1) in which he explained the interdependent relationships between the workers, the environment and behaviour. From this model, it is clear that the impact of one worker's behaviour will be felt throughout

the whole company as it is an interdependent cycle and all elements should be in line to ensure adherence to occupational health and safety industry standards.

A recent industry-specific study identified human factors as one of the main root causes of accidents during incident investigations and added it as part of their "incident causation model", which can be seen as Figure 2 below (Germaine *et al.*, 2011:135).

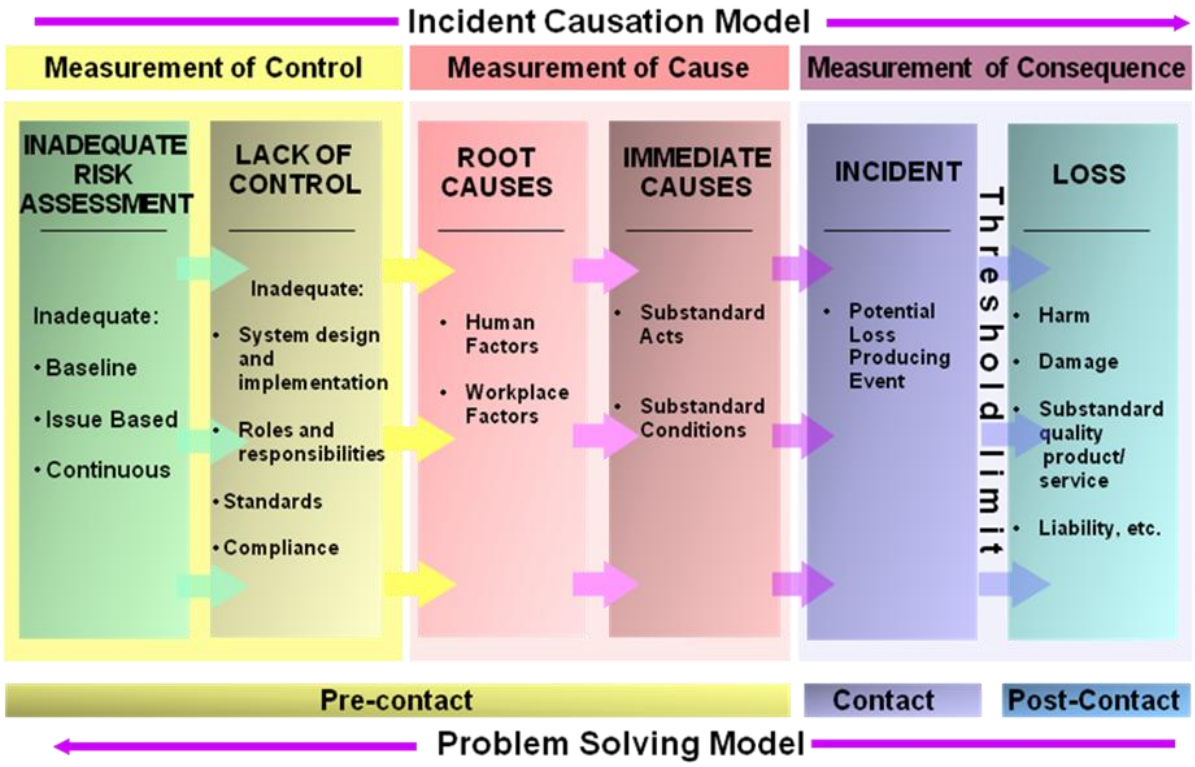

Figure 2: Incident causation model
Source: Germain *et al.* (2011:135)

Gilmore, Perdue and Wu (2002:1) describe behaviour as the "common denominator" in the process of injury prevention. Behaviour is present at every step of the process and it influences all the role players at one stage or another, thus solidifying the need to investigate which factors incline workers to engage in unsafe behaviour.

2.5 CONCLUSION

In the construction industry, behaviour plays a crucial role in occupational health and safety management. Regardless of the systems and policies in place, if the workers revert to non-compliance, unsafe conditions and high accident rates will persist. This study aimed to determine which individual factors would cause workers to revert to non-compliance or to engage in unsafe behaviour and the findings are discussed in the next chapter.

CHAPTER 3: SYSTEMATIC REVIEW OF LITERATURE

3.1 INTRODUCTION

A systematic review of existing academic literature available on the subject of individual characteristics in construction safety was the first step in the process of developing a framework.

As a technique, a systematic review identifies the evidence that will be relevant and accurate in terms of the design, quality and ability to address the research aim. The technique was first introduced in the medical field by the Cochrane Collaboration and has been adapted for use in different fields of management (Ginsberg and Venkatraman, 1985:422; Tranfield, Denyer & Smart, 2003:210). This method aims to minimise bias and is implemented through exhaustive literature searches with the added benefit of a detailed record of the process and conclusions (Cook, Mulrow & Haynes, 1997:370).

The type of literature used in the current study was determined by the research statement. The focus of the study was on the construction industry and specifically within the spheres of safety management and accident rates. This was then narrowed down to include the human or individual factors which impact on the aforementioned spheres. Literature which met the above criteria was included in the search.

Data collection in this step was conducted by scanning various databases using keywords identified for the study. By implementing this method, subjectivity of data collection was removed through the use of a predefined search algorithm (Crossan & Apaydin, 2010:1158). Data was analysed qualitatively through analytical data filtering by linking the data to the four identified categories through the use of descriptive matrixes (Miles & Huberman, 1994:239).

Data was synthesised through a process of elimination based on the execution phase as described in section 3.2.2 below.

3.2 METHODOLOGY DESCRIPTION

In a systematic literature review, certain steps have to be followed. This study adhered to the three-stage procedure as explained by Tranfield *et al*. (2003:211). The steps entail planning, execution and reporting.

3.2.1 The planning phase

In the planning phase, the key data sources were selected, namely peer-reviewed journals. The reason for this was that such sources would increase the validity and relevance of the research in terms of academic standards (Podsakoff, MacKenzie, Bacharach and Podsakoff, 2005:475). The type of literature used in the study was determined by the research statement. The focus of the study was on the construction industry and, more specifically, the spheres of safety management and accident rates. This was then narrowed down to include the individual factors which impact on the aforementioned spheres. Literature which met the requirements listed above was included in the search. The specific databases chosen were EBSCOhost's Academic Source Premier, for its comprehensive record of peer-reviewed articles in terms of occupational health and safety, and ScienceDirect for its comprehensive record of peer-reviewed articles on construction in general. A few other databases were used when more extensive research was required for a specific factor.

3.2.2 Execution

In terms of execution, keywords were determined for the searches, whereafter publications were grouped in terms of their specific focus areas. Then, categories were identified from the research through the identification of patterns or themes (Crossan & Apaydin, 2010:1159). The data was then classified and organised by use of the matrix and finally, the data was synthesised to develop a framework.

Identifying keywords

The search was very comprehensive and included a range of journal articles, books and reference works, ranging from 1994 to 2012. A few older sources were accessed independently from the search as the primary sources on specific aspects, with the oldest being from 1927, related to cognitive ability. The keywords used in the searches were determined by the research statement and the background research and are listed below:

- construction safety
- construction accident
- construction safety factors
- construction worker unsafe behaviour
- construction accident rate
- construction worker
- construction human factor
- construction accident management
- construction individual factor
- construction unsafe
- construction safety attitude
- construction safety management

The keywords were then assembled into nine search streams, which were used to conduct the electronic journal database searches:

1. construction
2. construction AND “safety factor*”;
3. “construction safe*” OR “construction accident”;
4. construction AND “human factor*” OR “individual factor*”;
5. construction AND worker AND “safe* behaviour” OR “unsafe behaviour”;
6. “construction worker” AND “safe* attitude”;
7. construction AND “safe* manage*” OR “accident manage*”;
8. “construction safety” AND factors;

9. “construction” AND “accidents” AND “causes”

Reporting

For the purpose of this study, scholarly articles published in English between 1998 and 2012 were included. A highly cited and esteemed peer-reviewed article with comprehensive research from 1976 to 1996 was used as historical background. In ScienceDirect, the first search term used was “construction”, which led to an initial result of 19 870 pages of peer reviewed articles, with 50 results per page, which formed the basis of the search into the other streams. The breakdown of the searches can be found in Table 3.1.

Table 2: Reported search results

Search streams	Search results from journal databases	Relevant papers to be fully reviewed	Included papers
construction	953 236	Used as basis for further searches – not added to totals	Used as basis for further searches – not added to totals
construction AND “safety factor*”;	54 039	61	22
“construction safe*” OR “construction accident”;	733	66	27
construction AND “human factor*” OR “individual factor*”;	14 4021	80	38
construction AND worker AND “safe* behaviour” OR “unsafe behaviour”;	162	49	23
“construction worker” AND “safe* attitude”;	70	45	4
construction AND “safe* manage*” OR “accident manage*”;	2 479	26	2
“construction safety” AND factors;	526	50	27
“construction” AND “accidents” AND “causes”	16 000	80	48
TOTALS	**218 030**	**457**	**191**

Grouping of publications

The initial results (953 236 items) were narrowed down to studies relating to the factors which tend to influence accident rates and adherence to safety standards on construction sites, by limiting the “construction” results to titles with the words “safety”, “factors” and “causes”. From this set, the titles and or abstracts of the various articles were read to determine their relevance to the study in terms of identifiable factors. A total of 135 journal articles were selected based on their identification of the various risk factors and the number of times they had been cited. Recent papers were included to ensure that the citation-based criteria did not discount these papers based on lower citations. From the initial 135 articles, 90 were chosen for their specific mention of human or individual factors relating to safety management or risk behaviour on construction sites, their clear identification of the factors and their linking to unsafe behaviour of workers or accident rates in construction. The selection of the final 90 articles was based in the following questions (Moustaghfir, 2008:14):

1. Did the research clarify the subjective meaning, actions and context of the construction workers?
2. Were actual factors relevant to individual behaviour identified?
3. Did the research cover real-life situations on the construction sites as experienced by management and workers alike?
4. Did the sample allow enough detail to allow the researcher to interpret the factors within the relevant context?
5. Was there a clear description of data analysis methods and were these appropriate to the design?
6. Did the research move from raw data to a meaningful and significant analysis and interpretation?
7. Were the findings relevant to theory?

The 90 identified articles were used to identify the factors, along with other sources, which expanded on the identified factors and the original primary sources, such as books and conference papers.

3.3 LITERATURE REVIEW

This section contains the literature review and a discussion of the definition of the term individual factors, the factors identified in the study and their impact on safety behaviour. The four categories of individual factors, namely knowledge and experience, perceptions and mindsets, attitudes and motivations and, lastly, personality characteristics are discussed and explained in further detail. Finally, each factor is expanded on in terms of its relationship to unsafe behaviour and the subsequent impact on accident rates.

3.3.1 Definition of individual factors

Thevendran and Mawdesley (2004:132) describe human risk factors as “individual, project team and organisational factors, which influence the behaviour of people and the climate at work, in a way which can increase or decrease productivity of a construction project”. Individual factors are listed as “capability, knowledge and skills, stress, motivation, emotional and cultural”. In the academic literature, the term ‘human factors’ mostly refers to factors found in management, organisations and direct supervisors (Butler & Jones, 1979:300; Chhokar and Wallin, 1984:283; Klumb and Wilbert, 1993; Langford, Rowlinson & Sawacha, 2000:133; Martella, 1992:70; Sawacha *et al*., 1999:310;). The focus of the current study was on the factors in the individual construction workers, with some attention to management and supervisor factors identified through the interviews. ‘Individual’ can be defined as “characteristic of a particular person or thing” and ‘factor’ is defined as “a circumstance, fact, or influence that contributes to a result” (AskOxford.com, Not dated). Therefore, for the purpose of clarity, the rest of this text will refer to individual factors and not to human factors.

Relating to these definitions, for the purpose of this study, individual factors were defined as factors that are particular to construction workers, contributing to the result of unsafe behaviour of workers on construction sites.

3.3.2 The main factors identified in previous comprehensive literature reviews

Historically, research into successful safety management focused on the following factors as described through comprehensive literature reviews by Jaselskis, Anderson and Russell (1996:62-63) and a more recent review by Tam, Zeng and Deng (2004:573). The secondary sources are deemed important towards this study in the interest of a comprehensive overview of the existing research in the field, which is the aim of the systematic literature review. Therefore, the secondary sources are cited as follows:

- Equipment status and access (Jaselskis & Suazo in Tam *et al.*, 2004; Krause in Tam *et al.*, 2004; Larsson & Field in Tam *et al.*, 2004).
- Guidelines for selecting safe contractors (Samalon & Levitt in Jaselskis *et al*., 1996).
- Increased job control for improved safety performance (Hinze & Pannullo in Jaselskis *et al*., 1996).
- Means for achieving and maintaining acceptable safety performance for large projects (Hinze & Rebound in Jaselskis *et al*., 1996).
- Safety programme practices associated with reduced injury rates (Gun in Tam *et al.*, 2004; Hale & Hovden in Tam *et al.*, 2004; Hinze & Harrison in Jaselskis *et al*., 1996; Krause in Tam *et al.*, 2004; Seppala in Tam *et al.*, 2004; Tam, Fung & Chan in Tam *et al.*, 2004).
- Speciality contractors' safety standards (Hinze & Figone in Jaselskis *et al.*, 1996).
- Supervisor characteristics associated with improved safety performance (Hinze & Parker in Jaselskis *et al*., 1996).
- Supervisor–worker relationships and their effect on injury rates (Hinze & Francine in Jaselskis *et al*., 1996).
- Technology control (Blank, Laflamme & Andersson in Tam *et al.*, 2004; Jannadi & Assaf in Tam *et al.*, 2004; Lingard & Holmes in Tam *et al.*, 2004).
- The safety impact of new workers and turnover rates (Hinze in Jaselskis *et al*., 1996);

- Top management's role in reducing construction accidents (Hakkinen in Tam *et al.*, 2004; Koehn in Tam *et al.*, 2004; Levitt & Parker in Jaselskis *et al*., 1996; Tam & Fung in Tam *et al.*, 2004; Wentz in Tam *et al.*, 2004).
- Training (Gun in Tam *et al.*, 2004; Hakkinen in Tam *et al.*, 2004; Hale in Tam *et al.*, 2004; Krause in Tam *et al.*, 2004; Tam & Fung in Tam *et al.*, 2004).
- Zero accident technique identification (Liska in Jaselskis *et al*., 1996).

As can be seen from the previous research, the focus was mainly on factors outside the individual, with only two studies related to worker behaviour (Hinze in Tam *et al.*, 2004; Yu in Tam *et al.*, 2004). The current study focuses on individual factors in the workers themselves and the next section will provide a detailed account of the systematic literature review regarding these factors.

3.4 INDIVIDUAL FACTORS IDENTIFIED IN THIS STUDY

The current study was interested in the internal factors of individuals. The rest of this chapter will therefore focus on the individual factors identified in the research as influential regarding safety behaviour of construction workers. These factors are listed in Table 4. In the segment following the table, the factors are explained in terms of their impact on safety behaviour.

The four categories of individual factors were conceptualised in terms of the general characteristics of the different factors, namely knowledge and experience factors, factors relating to perceptions and mindsets, factors relating to attitudes and motivations and, lastly, personality characteristics, based on their application in the research consulted and general views on human factors from the research (Bea, 1998:114; Garret & Teizer, 2009; Henning, Stufft, Payne, Bergman, Mannan & Keren, 2009:337; Thevendran & Mawdesley, 2004:133).

In the interest of readability of the table, the sources with more than two authors are cited as *et al*. in the table, even though they are being mentioned here for the first time. The missing authors are indicated in the text following the table.

Table 3: Individual factors identified in the reviewed literature

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Age	KE	Worker's chronological age in years, length of time lived	Low or high, depending on external environment	Alavinia *et al.*, 2007; Cheng *et al.*, 2010; Eppenberger, 2008; Evans and Wasielewski, 1983; Fang *et al.*, 2004; Frone, 1998; Jonah, 1986; Khanzode *et al.*, 2012; Kingsma, 1994; Nouri *et al.*, 2008; Root and Hoefer, 1979; Siskind, 1982; Siu *et al.*, 2003; Stalneker, 1998; Topf, 2000
Work experience and knowledge	KE	Knowledge or skill acquired by completing the job duties and partaking in safety procedures	Low or high, depending on personal motivation	Butler and Jones, 1979; Choudhry and Fang, 2008; Dwyer and Raftery, 1991; Fang *et al.*, 2004; Garret and Teizer, 2009; Henning *et al.*, 2009; Khanzode *et al*., 2012; Koehn *et al*., 1995; 2003; Nouri *et al*., 2008; Shappell and Wiegmann, 2001; Siu *et al*., 2003; Törner & Pousetteand Pousette, 2009; Vinodkumar and Bhasi, 2009; Wilson, 1989
Education level	KE	Academic qualifications and further training	High	Cheng *et al*., 2010; Erwin and Iverson,, 1997; Laukkanen, 1999; Price, 1977; Rowlinson, 2003; Starren *et al.*, 2009; Zwetsloot *et al*., 2006
Cognitive ability	KE	The level of mental action or process of acquiring knowledge and understanding through thought, experience, and the senses	High (related to conscientiousness)	Dilchert *et al*., 2007; Henig, 1927; Postlethwaite *et al*., 2009; Wallace & Vodanovich, 2003
Interpersonal skills	KE	Worker's ability to relate meaningfully with co-workers	High	Gillen *et al*., 2004; Starren, *et al*., 2009
Attention span	KE	A worker's ability to concentrate and focus on the task at hand	High	Henning *et al*., 2009; Shapira and Lyachin, 2009

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Stress tolerance	KE	Ability to cope with mental, emotional or physical tension, strain or distress	High	Bea, 1998; Bergh and Theron, 2009; Cooper and Kelly, 1984; Henning *et al*., 2009
Discipline	KE	Worker shows a controlled way of working	High	Shapira and Lyachin, 2009
Workers' perceptions of safety and risk	PM	The way in which exposure to danger is regarded, understood or interpreted	Own risk awareness is high	Arezes and Miguel, 2008; Choudhry and Fang, 2010; Dejoy, 1990; Langford *et al*., 2000; Mullen, 2004; Sheehy and Chapman,1987; Wilson, 1989
Workers' perceptions of safety climate or culture	PM	The way in which a worker understands the safety of the working environment and how management feels about safety	Perception of safety climate is positive	Arezes and Miguel, 2008; Beus *et al*., 2010; Campbell *et al.*, 1970; Canter and Donald, 1990 Cavazza and Serpe, 2009; Cheyne *et al.*, 2002; Choudhry *et al.*, 2009; Clarke, 2004; Clarke, 2006; Cox and Cox, 1991; DeDobbeleer and Beland, 1991; Dejoy, 1994; Guastello and Guastello, 1988; Guldenmund, 2000; Harrell, 1990:; ; Hayes *et al.*, 1998; Larsson *et al.*, 2008; McDonald *et al.*, 2009; Mohamed, 2002; Morrow *et al.*, 2010; Murphy *et al.*, 1993; O' Toole, 2002; Seo, 2005; Smith *et al*., 1978; Starren *et al.*, 2009; Vinodkumar and Bhasi, 2009; Wallace *et al.*, 2006; Zohar, 1980; Zohar, 2002; Zohar and Luria, 2004
Workers' perceptions of management's commitment to safety	PM	The way in which a worker understands management's views and attitudes toward safety	Perception of management's commitment is positive	DeDobbeleer and Beland, 1991; Dejoy, 1994; Fogarty and Shaw, 2010; Keren *et al.*, 2009; McDonald *et al.*, 2009; Murphy *et al.*, 1993; Seo *et al.*, 2004; Vinodkumar and Bhasi, 2009; Zohar, 1980

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Workers' perceptions of supervisor's commitment to safety	PM	The way in which a worker understands supervisors' views and attitudes toward safety	Perception of supervisors' commitment is positive	Bradley, 1978; Choudhry *et al.*, 2009; Dejoy, 1994; Langford *et al.*, 2000
Workers' perceptions of co-workers' commitment to safety	PM	The way in which a worker understands co-workers' views and attitudes toward safety	Perception of co-workers' commitment is positive – if they value safety	Ball *et al.*, 2009; Burnkrant & Cousineau, 1975; Cavazza and Serpe, 2009; Chang and Wang, 2010; Choudhry and Fang, 2008; Choudhry *et al.*, 2009; Clarke and Ward, 2006; Cousineau, 1975; Dejoy *et al.*, 2004; Gillen *et al.*, 2004; Janis, 1983; Jiang *et al.*, 2010; Langford *et al.*, 2000; Lapinski and Rimal, 2005; Larsson *et al.*, 2008; Morrow *et al.*, 2010; Mullen 2004; Omogoroye and Oke, 2007; Starren *et al.*, 2009; Subramaniam, 2004; Zohar, 1980
Workers' perceptions of masculinity	PM	The permanence of a job in the worker's understanding	High	Cheyne *et al.*, 1998; Choudhry and Fang, 2008; Connell, 1995; Gillen *et al*., 2004; Hayes, 2002; Iacuone, 2005; Lynch, 1997; Mullen, 2004; Paap, 2003; Starren *et al.*, 2009
Workers' perceptions of job security	PM	The permanence of a job in the worker's understanding	High	Cheyne *et al.*, 1998; Choudhry and Fang, 2008.
Affect	P	Affect refers to the worker's emotion or desire as influencing behaviour	Positive	Iverson and Erwin, 1997; Khanzode *et al.*, 2012; Paul and Maiti, 2005; Wright, 1986
Fatalistic mindset	AM	A worker's belief that all events are predetermined and therefore inevitable, which can result in a submissive attitude to events	Low/non-existent	Kouabenan 1998; Mainelli, 2004: Rundmo and Hale, 2003; Williamson *et al.*, 1997

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Supervisor's attitude towards workers' safety	AM	The supervisor's predisposition to behave in a certain way towards objects or workers in terms of safety	Positive	Andriessan, 1978; Choudhry and Fang, 2008; Gillen *et al.*,2004; Hayes *et al.*, 1998; Iverson and Erwin, 1997; Langford *et al.*, 2000; Michaels and Spector, 1982; Mullen, 2004; Omogoroye and Oke, 2007; Paap, 2003; Sawacha *et al.*, 1999; Simard and Marchand, 1994; Starren *et al.*, 2009
Workers' safety attitudes	AM	The way a worker feels about and understands safety	Positive	Ball *et al.*, 2009; Canter and Donald, 1990; Choudhry and Fang, 2008; Choudhry *et al.*, 2009; Cox and Cox, 1991; Donald and Young, 1996; Fang *et al.*, 2006; Gillen *et al.*, 2004; Mohamed, 2002; Mohamed *et al.*, 2009; Mullen, 2004; Sawacha *et al.*, 1999; Vinodkumar and Bhasi, 2009
Workers' attitudes towards teamwork	AM	The willingness of a worker to work together with co-workers to achieve a common goal	High	Abdelhamid and Everett, 2000; Cupido *et al.*, 2009; Hinze, 1996; Iverson and Erwin, 1997; Mitropoulos *et al.*, 2009; Wright, 1986
Workers' safety motivations	AM	The force that influences or causes a person to do something or act in a certain way in terms of safety	High	Ajzen, 1991; Donald, 1996; Larsson *et al.*, 2008; Lingard and Yesilyurt, 2003; Neal and Griffin, 2006; Parker *et al.*, 2003
Submissive attitude	AM	Worker's willingness to accept or yield to a superior or to the authority or will of another person	High	Shapira and Lyachin, 2009
Assertive	P	Workers' ability to state their opinion and make objections known and having or showing a confident and forceful personality	High	Cupido *et al.*, 2009; Gillen *et al.*, 2004

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Trustworthy	P	A person who is able to be relied on as honest or truthful	High	Butler, 1991; Clark and Payne, 1997; Creed and Miles, 1996; Flin and Burns, 2004; McAllister, 1995
Level-headed	P	Being calm and sensible, especially in risky situations at work	High	Shapira and Lyachin, 2009
Vigilant	P	A worker's ability to watch out carefully for possible danger or difficulties	High	Henning *et al.*, 2009; Shapira and Lyachin, 2009
Agreeable		Agreeableness relates to cooperation, empathy, selflessness and identification with others	High	Clarke, 2006; Clarke and Robertson, 2005; Graziano and Eisenberg, 1997
Extravert	P	The extent to which the worker seeks out, enjoys and is confident in social situations	Moderate	Hansen, 1989; Forcier *et al.*, 2001; Henning *et al.*, 2009; Iverson and Erwin, 1997; Watson and Clarke, 1997; Rosenbloom and Wolf, 2002; Shaw and Sichel, 1971; Ulleberg and Rundmo, 2003; Zuckerman, 1994
Neurotic	P	Worker is abnormally sensitive, obsessive or anxious	Low	Forcier *et al.* 2001; Hansen, 1989; Henning *et al.*, 2009; McCrae and Costa, 1992; Perkins and Corr 2006; Postlethwaite *et al.*, 2009; Shaw and Sichel, 1971; Sutherland and Cooper, 1991
Conscientious	P	Worker is committed to do the work well and thoroughly	Dependant on cognitive ability	Arthur and Doverspike, 2001; Goldberg, 1990; Hogan and Ones, 1999; McCrae and Costa, 1992; Mount and Barrick, 1995; Perkins and Corr 2006; Törner & Pousetteand Pousette, 2009; Wallace and Chen, 2006; Wallace and Vodanovich, 2003

Individual factor	Category	Description of individual factor (Oxford definition)	Contributes to safety behaviour if …	References (*et al.* sources and page no are provided in text)
Open to experience	P	Worker indicates an interest in new experiences, shows comfort with ambiguity and an appreciation for artistic and imaginative activities	Undetermined	Henning et al, 2009; McCrae and Costa, 1992; Tesch and Cameron, 1987
Locus of control	P	The extent, to which a worker believes the current and anticipated circumstances, and subsequent response to them (behavior), are within his/her control.	Internal	Forcier *et al.*, 2001; Jones and Wuebker, 1993; MacDonald, 1973; Murray *et al.*, 1997; Rotter, 1954; Starren *et al.*, 2009
Type A behaviour pattern	P	Worker tends to rush work, has time urgency and can at times be aggressive	Low	Frone, 1998; Henning et al, 2009; Price, 1983; Shahidi *et al.*, 1991; Sutherland and Cooper, 1991; Ulleberg and Rundmo, 2003

Key: **KE** = Knowledge & experience **PM** = Perceptions & mindset **AM** = Attitudes, mindsets & motivations **P**= Personality characteristics

3.4.1 Knowledge and experience factors

In order to understand the relevance of the category, the definitions of the words are indicated. Knowledge is described as “facts, information and skills acquired through experience or education or the theoretical or practical understanding of a subject” (oxforddictionaries.com, Not dated). In other words, knowledge in this section describes construction workers’ facts, information and skills which were acquired through working in the industry or industry specific training.

Experience is described as “the knowledge or skill acquired by a period of practical experience of something; especially that gained in a particular profession” (oxforddictionaries.com, Not dated). Therefore, in this category, construction workers’ experience related to their knowledge of construction work and skill required to do the work, which they have gained through working in construction.

All the factors which have been found in the research to impact on knowledge and experience have been added to this category and will be explained in detail in this section.

Age

Age is defined as “the length of time that a person has lived” (oxforddictionaries.com, Not dated). Studies on age relate to safety behaviour, and accident rates tend to offer conflicting opinions of the impact of age on safety behaviour.

Certain studies measuring the impact of age on safety attitudes and awareness determined that the higher rate of work satisfaction of older workers give them a more positive attitude towards safety procedures, as older workers have greater knowledge of the job, patience and work skills than younger workers (Fang, Huang & Hinze, 2004:427; Frone, 1998:565; Khanzode, Maiti & Ray, 2012:1361; Kingsma, 1994:1026; Stalneker, 1998:28; Topf, 2000:49). The increased experience and workmanship of older workers were also shown to contribute to their lower accident rates (Eppenberger, 2008:106; Evans & Wasielewski, 1983:130; Jonah, 1986:262; Nouri, Azadeh & Fam, 2008:323). The limited number of job opportunities was also shown to be linked with older workers’

increased work commitment and adherence to safety regulations (Siu, Phillips & Leung, 2003:206). Younger inexperienced workers, who were new to work sites, showed higher accident rates than older workers (Nouri *et al*., 2008:323; Root & Hoefer, 1979:78; Siskind, 1982).

Opposing views determined that older workers (60 years and above) showed a higher percentage of occupational accidents, as most of these labourers had a low education level and were temporary workers (Siu, *et al*., 2003:200) Specific injuries, such as knee and back injuries were shown to be more prevalent with older workers (Eppenbeger, 2008:109). Injuries in older workers were also shown to be more severe and fatalities were seen to occur more frequently in this group, as a result of increased illness and loss of work performance due to older age (Alavinia *et al.*, 2007:354; Siu *et al.*, 2003:199). This was also shown to result in more costs related to injuries for older workers (Eppenbeger, 2008:110).

Age has been proved to impact safety behaviour positively or negatively, depending on a variety of factors, including amount of exposure to training and knowledge of safety processes (Eppenbeger, 2008:111).

Work experience and knowledge

Workers' knowledge and experience in terms of construction work relate to "facts, information and skills which were acquired through working in the industry or industry specific training", as well as their knowledge of construction work and skill required for the work (oxforddictionaries.com, Not dated).

Experience in terms of work knowledge and exposure to the workplace environment and procedures has been reported as positive and negative in various studies. Törner & Pousette (2009:403) determined that a worker's own experience of accidents or of co-workers' accidents increases risk awareness. Butler and Jones (1979:303) suggest that more experienced workers have greater role clarity, and therefore they require less structure and consideration from their leaders, while junior workers experience greater needs for both structure and consideration.

Problem solving was also shown to be improved by the gathering of knowledge and experience in a group situation (Wilson, 1989:305). In linking with the age factor, older workers are more experienced and have been shown to have a decreased accident risk (Fang *et al*., 2004:424; Koehn *et al*., 1995:262; Siu *et al*., 2003:205). Younger workers were shown to be more accident prone, as time spent in the environment related to experience and awareness of safety procedures (Choudhry & Fang, 2008:576; Khanzode *et al*., 2012:1361; Nouri *et al*., 2008:323).

In contrast, experience has also been related to negligence due to older workers' time spent in the industry and indifference towards continual adherence to safety procedures. The research indicates that complacency leads to increased unsafe behaviour (Dwyer & Raftery, 1991:170; Garret & Teizer, 2009:760; Henning *et al*., 2009; Shappell & Wiegmann, 2001; Vinodkumar & Bhasi, 2009:666).

In conclusion, experience and knowledge can impact safety behaviour positively in terms of increased problem-solving abilities and workmanship, but it can also have a negative impact in the form of negligence and complacency.

Education level

Education is defined as "the process of receiving or giving systematic instruction, especially at a school or university" (oxforddictionaries.com, Not dated).

In general, construction workers are sourced from the uneducated segment of a country's labour profile (Starren, Dijkman, Van der Beek & Gallis, 2009:1). These people are also more vulnerable to poor working conditions due to the fact that employment for uneducated labourers tends to be limited and workers therefore cannot readily refuse work if the environment is unsafe (Starren *et al*., 2009:2).

Low education levels have been shown to affect safety behaviour negatively, in the form of a direct relationship between education levels and accident proneness (Iverson & Erwin,

1997:116; Laukkanen, 1999:53; Price, 1977:15; Rowlinson, 2003:170; Siu *et al*., 2003:205).

Behavioural determinants need to be considered when dealing with workers with low education levels (Starren *et al*., 2009:6). These factors are listed as follows:

- adequate awareness of the risks (and of the effects of their own actions and motivation to do something about the risks);
- sufficient knowledge about possible interventions and safe behaviour, and a lack of skills to apply that knowledge in practice;
- sufficient control options (opportunities to actually employ knowledge and skill);
- safe behaviour as a result; and
- lasting change or assurance of safety behaviour in the long term.

Along with the above-mentioned factors, the peer group, the company and the sector also weigh in on the behaviour of workers with low education levels (Zwetsloot, Gort, Steijger & Moonen, 2006:772). Thus, it can be determined that if these individual and environmental factors are not conducive to a safe environment, workers with low education levels would more easily engage in unsafe behaviour.

Cognitive ability

Cognition is a skill, which is defined as “the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses whereas ability relates to possession of the means or skill to do something” (oxforddictionaries.com, Not dated). Therefore, the cognitive ability of construction workers refers to their ability to acquire knowledge and understanding on matters pertaining to their work environment.

Postlethwaite, Robbins, Rickerson and McKinniss (2009:715) determined that cognitive ability influences factors such as work-related knowledge, training performance and work performance. Lower cognitive ability has been linked to increased accident proneness (Dilchert, Ones, Davis & Rostow, 2007:618; Henig, 1927:82), but limited research has been conducted on this relationship. Postlethwaite *et al*. (2007:712) suggested that cognitive ability and conscientiousness be studied together, as previous research indicated that low levels of conscientiousness coupled with low cognitive levels led to increased accident rates and lower safety behaviour levels (Wallace & Vodanovich, 2003:316).

Workers with high levels of cognitive ability were indicated as more likely to engage in safety behaviour regardless of their conscientiousness.

Interpersonal skills

Interpersonal skills refer to “the ability to communicate and relate well to other people” (oxforddictionaries.com, Not dated). In this study, it refers to interaction between workers themselves and workers, supervisor and management.

Interactions with other co-workers can lead to increased safety awareness and education. Workers themselves acknowledged that those workers who did not work well or who do not relate well with other co-workers were exposed to higher risks (Gillen, Kools, McCall, Moulden & Sum, 2004:251). The ability to communicate effectively with co-workers also has an impact on the ability to act differently in order to help change unsafe behaviour (Starren *et al*., 2009:8).

Attention span

Attention span is a skill which refers to “the length of time for which a person is able to concentrate on a particular activity” (oxforddictionaries.com, Not dated).

Workers on construction sites have to be able to remain focused throughout their shift, as accidents can occur at any moment (Henning *et al*., 2009; Shapira & Lyachin, 2009:29). A worker who is easily distracted has a higher risk of being injured or causing injury to others than one who can remain focused.

Disciplined

Discipline is a skill which refers to “the ability of people to obey rules or a code of behaviour” (oxforddictionaries.com, Not dated). Construction workers have to obey safety regulations and procedures.

Workers have to be disciplined and not defiant or disobedient, as adherence to supervisor instructions and safety guidelines were proved to have a significant effect on the possibility of accident occurrence (Shapira & Lyachin 2009:30).

Stress tolerance

Stress tolerance is a skill which relates to “the capacity to endure a state of mental or emotional strain or tension resulting from adverse or demanding circumstances” (oxforddictionaries.com, Not dated).

Often, when accidents happen on construction sites, there is little time to reflect on how to avoid damage or injury. In psychology theory, a certain amount of stress is required to maintain optimum performance (Bergh & Theron, 2009:141). When that amount of stress increases beyond the optimum level, production will suffer.

Workers therefore need to be able to manage this stress in order to remain calm in a dangerous situation (Bea, 1998:114). In Cooper and Kelly (1984:575), crane operators’

ability to cope with high stress levels directly impacted their ability to prevent accidents or minimise the damage thereof. In recent research, Henning *et al*. (2009:343) found that the ability to cope with mental, emotional or physical tension, strain or distress affects a worker's safety behaviour.

In view of these findings, it can be established that a high stress tolerance level is required to adhere to safety processes and procedures in dangerous situations.

3.4.2 Perceptions of workers

Perception refers to "the way in which something is regarded, understood, or interpreted" (oxforddictionaries.com, Not dated). Various perceptions which are held by construction workers and which impact on their safety behaviour were identified in the research and are discussed in the following section.

Workers' perceptions of safety and risk

Risk perception has been proved to have a positive effect on safety behaviour if the individual has high risk perception levels. Risk perception is the way workers see risk and observe their environment, and it has been linked to misinterpretation of potential risk sources and proved to have a direct impact on worker safety (Choudhry & Fang, 2008:576; Dejoy, 1994; Mullen, 2004:279). Sheehy and Chapman (1987:25) suggested that the more accidents the worker becomes aware of or is involved in, the greater the perceived risk becomes.

Ignorance regarding or failure to adhere to safety procedures has been identified as the main contributor to risk (Wilson, 1989:305). Lowered risk perception has been linked to increased carelessness regarding safety procedures and increases in occupational accidents (Arezes & Miguel, 2008:902). In cases where individuals engaged in unsafe behaviour even when they were aware of the risks, co-workers' and supervisors' opinions regarding the individual's performance regarding adherence to deadlines outweighed the adherence to safety practices (Mullen, 2004:279). Risk taking is strongly related to reward

practices, because rewarding increases productivity instead of safety adherence and this might lead to increased risky behaviour (Langford *et al.*, 2000:138).

High levels of risk perception can therefore be said to increase adherence to safety procedures and decrease unsafe behaviour.

Workers' perceptions of safety climate or culture

Certain studies refer to safety culture and others to safety climate, although their meanings seem to be similar and the evidence for differences is not supportive of interdependence (Cheyne, Cox, Oliver, & Tomás, 2002:651; Guldenmund, 2000:215; McDonald, Lipscomb, Bondy & Glazner, 2009:60). Therefore, in the interest of this study, we assumed that safety culture and safety climate refer to the same thing and we will use safety climate as descriptor, because this is the concept most often referred to in research.

Safety climate does not relate to values, beliefs or attitudes, but rather to perception, and more specifically "management's commitment to safety as perceived by the workers" (Choudhry, Fang & Lingard, 2009:897; Clarke, 2006:424; Zohar, 2002:76; Zohar & Luria, 2004:324). Various definitions of safety climate exists, the first containing categories with major dimensions, including individual autonomy, structure of job functions, remuneration orientation and deliberation, tenderness and support (Campbell, Dunnette, Lawler & Weick, 1970). Companies with low accident rates have been determined to have high levels of management commitment and involvement in safety (Smith, Cohen & Cohen, 1978:6). Zohar (1980:97) added that safety climate refers to "workers' perceptions and expectations regarding management's view of the importance of safety in relation to productivity". Zohar (2002:80) also later established that these perceptions and expectations evolve along with leadership and the organisation's climate. Wallace, Popp and Mondore (2006:670) expanded on this idea by stating that "safety climate is the shared perceptions of the importance and focus on safety policies, procedures and practices in the working environment".

The bulk of past research has focused on safety climate as contributor to accident rates and safety behaviour. Zohar (1980:100) suggested a relationship between safety climate and safety performance and Dejoy (1990:100) linked general safety climate to workplace safety in his study on attribution theory and workplace safety. Similarly, Cox and Cox (1991:16) and Canter and Donald (1994:112) later found a clear correlation between safety attitudes related to the climate and worker safety performance. In general, it has been established that workers' perceptions of the safety climate can be linked to variables related to accident rates (Hayes, Perander, Smecko & Trask, 1998:146).

In support of this, various studies found that workers who perceive the safety climate as positive, are involved in fewer accidents than those who perceive it negatively, due to the fact that a positive perception leads to lower levels of anxiety and stress, which have been linked to accident rates (Guastello & Guastello, 1988:15; Harrell, 1990:1352; Hayes *et al*., 1998:146; Mohamed, 2002:376; O' Toole, 2002). Griffin and Neal (2000:348) referred to psychological safety climate, defining it as "a worker's perception of the value or priority of safety in the company". This term contributes to explaining worker safety behaviour.

Morrow *et al*. (2010:1465) found that psychological perceptions of safety climate are related more strongly to safety behaviour than perceptions of management's safety commitment and co-workers' commitment to safety. This can be ascribed to the fact that psychological aspects include a caring, supportive management approach to safety, which in return establishes a worker's safety motivation and safety knowledge (Larsson, Pousette & Törner, 2008:411).

Although no conclusive definition of safety climate has been established, two factors have been identified as key to creating the safety climate, namely management's commitment and workers' involvement (DeDobbeleer & Beland, 1991:100; Dejoy, 1994:12-14; Murphy, Sturdivant & Gershon, 1993).

Cavazza and Serpe (2009:281) acknowledged this specifically by determining in their study that the perception of the safety climate at a construction site influenced self-reported unsafe behaviour of construction workers. An ambiguous climate, where some rules are followed and others ignored, leads to a higher reported unsafe behaviour rate. A climate where rules are followed and adhered to by all participants and attitudes is conducive to safety practice and leads to lower reported unsafe behaviour rates (Clarke, 2004:423). The inter-correlations between the variables mentioned above are displayed in Table 3.3 below and indicate positive correlations for perceptions of company safety concern, senior managers' safety concern and supervisors' attitudes toward safety and negative correlations of these variables with work pressure. The first three dimensions are positively correlated both with ambivalence and unsafe behaviours, whereas work

pressure is negatively correlated to them. Ambivalence is also shown to have a positive correlation with self-reported frequency of unsafe behaviours.

Table 4: Descriptive statistics and inter-correlations

Variable	Mean	Standard deviation	1	2	3	4	5	6
1.Unsafe behaviour	2.16	1.10	-	-.23**	-.23**	-.22**	-.20**.	12**
2.Ambivalence	1.35	.90		-	-.31**	-.34**	-.35**	.25**
3.Company safety concern	3.10	.63			-	.72**	.58**	-.39**
4.Senior managers' safety concern	3.10	.67				-	.60**	-.40**
5.Supervisors' attitude toward safety	3.31	.76						-.41**
6. Work pressure	2.65	.79						

(N=345)

Source: Cavazza and Serpe (2009:281) * p < 0.05. ** p < 0.01.

Negative safety climates can influence the causal thinking of workers and lead them to engage in erroneous decision-making and unsafe behaviour. A positive safety climate should lead to workers who are motivated to employ safety-conscious behaviour, due to their perceived notion that the effort used to behave safely is valuable (Morrow, McGonagle, Dove-Steinkamp, Walker, Marmet & Barnes-Farrella, 2010:1461).

In conclusion, it has been established that perceived safety climate is one of the best predictors of unsafe work behaviour and accident rates (Arezes & Miguel; 2008:904; Beus, Bergman & Payne, 2010:1431; Cavazza & Serpe, 2009:280; Clarke, 2006:424; Larsson *et al*., 2008:406; Seo, 2005; Starren *et al*., 2009:6; Vinodkumar & Bhasi, 2009:666).

Workers' perceptions of management's commitment to safety

As established in the previous section, commitment to safety needs to start at the top for effectively application in the organisation (DeDobbeleer & Beland, 1991:100; Dejoy, 1994:12-14; McDonald *et al*., 2009:60; Murphy *et al.*, 1993). Various concepts have been used to explain management commitment, namely the attitudes management holds towards safety (Zohar, 1980:96), the concern management has for workers' safety and

well-being (Brown & Holmes, 1986:460) and management's commitment towards safety (DeDobbeleer & Beland, 1991:100).

Management's commitment to safety impacts on worker commitment to safety and therefore warrants an investigation into this factor over and above a safety climate discussion, due to its various implications for safety in the workplace (Seo, Torabi, Blair & Ellis, 2004:430). Management's commitment and attitudes towards safety versus their concern for production rates directly impact on the workers' perception of the safety climate and their subsequent adherence to safety regulations (Fogarty & Shaw, 2010:1458; Keren, Mills, Freeman & Shelley, 2009:1312; Mullen, 2004:279; Vinodkumar & Bhasi, 2009:666; Zohar, 1980:97).

Workers' perceptions of supervisors' commitment to safety

In terms of construction, the supervisor is seen as the manager (Bradley, 1978:60); therefore, the need for commitment applies to them in a construction environment. Supervisors' attitudes toward safety and their behaviour towards workers play a key role in worker safety behaviour (Bradley, 1978:60; Dejoy, 1994:10; Choudhry *et al*., 2009:892; Langford *et al*., 2000:138).

Dejoy (1994) linked general supervisory response to safety events with workplace safety in his study on attribution theory and workplace safety. When supervisors showed interest and gave personal attention to workers, the workers felt that their safety was important to management, which led to higher safety behaviour in workers. In a recent study, workers indicated they felt at ease with supervisors who cared about their own workers' safety (Choudhry & Fang, 2008:575; Langford *et al*., 2000:133). In another study (Gillen *et al*., 2004:249), focus group sessions revealed that management support for creating and strengthening a safety culture is a key factor in maintaining a safe workplace. Perceived responsibility for safety has also been indicated as dependent on the perceived climate. When the climate is poor, employees and managers blame each other for not adhering to workplace safety, but when the climate is perceived as good, all parties tend to claim equal responsibility for workplace safety (Chang & Wang, 2010:61; Omogoroye & Oke,

2007:589). Larsson *et al*. (2008:411) determined that improving management's behaviour towards safety could in turn improve worker safety behaviour.

It is therefore justified to conclude that management plays a significant role in determining safety climate, and without supervisor support, the perceptions of safety climate tend to be negative, which in turn affects safety behaviour negatively.

Workers' perceptions of co-workers' commitment to safety

Workers spend most of their day with their co-workers and can quickly adopt the attitudes of those around them (Choudhry *et al.*, 2009:892; Clarke & Ward, 2006:1178; Dejoy, Schaffer, Wilson, Vandenberg & Butts, 2004:83; Subramaniam, 2004:115). According to Burnkrant and Cousineau (1975:206), one of the most important factors affecting an individual's behaviour is the influence of those around him.

Workers' perception of their co-workers' commitment and involvement in adherence to safety practices has a direct influence on their own commitment to safety (Ball, Wilcock & Aung, 2009:205; Cavazza & Serpe, 2009:280; Mullen, 2004:279; Omogoroye & Oke, 2007:590; Starren *et al*., 2009:6). One worker reported that, even though they received training, once they were actually working a shift, his "co-workers and supervisors did things the fastest way possible and no one cared about safety" (Mullen, 2004: 279). This account displays the importance of the influence of others on safety behaviour.

This influence is a social process and affects a worker's perception of social status (Lapinski & Rimal, 2005:130; Zohar, 1980:96). Workers tend to value the opinion of those who share backgrounds that are similar to their own, which could lead to a positive or negative attitude towards safety, depending on the safety beliefs, behaviour and habits of their co-workers (Jiang, Yu, Li & Li, 2010:1469). In addition, the ability of a worker to employ so-called "groupthink" (Janis, 1983). It can be defined as "the mode of thinking that happens when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives". Groupthink can have an influence on safety-related decision-making and receptivity to advice and input from supervisors and co-workers.

In conclusion, it can be determined that co-workers' perception of safety has a direct impact on a worker's safety behaviour, commitment to safety and on the overall perception of the safety climate of the company (Morrow *et al*., 2010:1462).

Workers' perceptions of masculinity

Various studies have indicated that the perception of masculinity is linked to factors which contribute to unsafe behaviour, like horsing around and aggression, specifically in the construction industry (Connell, 1995:45; Hayes, 2002:637; Lynch, 1997:75; Paap, 2003:200). Williams (1993:70) and Hopkins (1995:140) argued that class position rather than masculinity conditioned workers' thinking.

Recent research by Iacuone (2005:265) and Choudhry and Fang (2008:576) determined that the concept of wanting to be perceived as a "tough guy" caused some workers to behave unsafely. While workers behaved safely during training, on site, they encouraged each other to take on risky tasks in order to seem brave and tough. In these instances, they also avoided wearing protective gear, as they were afraid of being teased by their co-workers.

Another study revealed that individuals would take greater risks and partake in unsafe work behaviour if it meant that it would improve their image. They would go to great lengths to avoid using safety equipment and wearing protective gear in order to ensure that others perceive them as "macho" or manly (Mullen, 2004:279). Fear of teasing and harassment by co-workers also caused workers to avoid wearing protective gear (Mullen, 2004:280; Starren *et al*., 2009:8). Co-worker intimidation or ridicule has been proved to cause workers to ignore safety regulations (Gillen *et al*., 2004:252; Iacuone, 2005:262).

In view of current research and past findings, it can be said that inaccurate perceptions of masculinity relate to workers disregarding safety precautions, which leads to unsafe behaviour on construction sites.

Workers' perceptions of job security

In one study, it was found that permanent employees understood the safety rules and regulations better than temporary workers, who were already trying to find other jobs before the current project had ended (Choudhry & Fang, 2008:560). Job security, therefore, showed a direct correlation with adherence to safety regulations. Permanent workers were also found to have more positive attitudes towards safety management than other employment groups (Cheyne *et al.*, 1998:4).

Affect

Iverson and Erwin (1997:130) investigated the role of affect in occupational injuries. Affect refers to emotion or desire as influencing behaviour. Negative affect (NA) refers to negative emotions and experiences when perceiving situations. In contrast, positive affect (PA) describes the tendency to perceive situations in a generally positive and enthusiastic manner (Iverson & Erwin, 1997:114). These definitions indicate that affect is a form of perception, which is the reason for its inclusion in this category.

Evidence for the effects of negative affectivity and positive affectivity on safety behaviour has been researched extensively and it has been shown to increase or decrease the risk of injury (Wright, 1986:280).

Workers who display high PA, was found to report self-efficacy and control over their environment, which links with the factors self-esteem and internal locus of control. In their study, Iverson and Erwin (1997:115) linked high PA with a high degree of task engagement, which led to decreased injury risk. Added to this, were more accurate and systematic decision-making skills, which gave way to thoughtful and careful evaluations of risk situations, which reduced accident potential. Iverson and Erwin's findings indicated that the enthusiastic viewpoint of high PA individuals, together with an increased tendency to actively control their environment, led to decreases in the accident rate.

Contrasting this, workers with high NA displayed lapses in attention and were easily distracted, which increased accident proneness. NA has been proved to correlate strongly with injury (Khanzode *et al*., 2012:1361; Paul & Maiti, 2005:50). Lower task engagement and less control over their environment also led these workers to increased accident

proneness. Watson and Clark (1997:230), indicate that people who express high negative affectivity view themselves and the world around them in generally negative terms.

In effect, we could deduct from these findings that NA relates negatively to safety behaviour, whilst positive affect shows a positive relationship.

3.4.3 Attitudes, mindsets and motivations

An attitude is defined as “a settled way of thinking or feeling about something” (oxforddictionaries.com, Not dated). In this section, mindsets are also incorporated, due to the fact that a mindset is defined as “the established set of attitudes held by someone” (oxforddictionaries.com, Not dated).

Steers (1981:5) defined an attitude as a “predisposition to behave in a certain way towards objects or persons in one’s environment”. Ajzen (1988:5) incorporated behaviour into the concept by stating that attitude is “someone's positive or negative evaluation of performing a particular behaviour of interest”. In this regard, motivation can be understood to stem from attitudes, in that it relates to a reason or reasons for acting or behaving in a particular way, which is shaped and guided through attitudes (oxforddictionaries.com, Not dated).

Lingard and Yesilyurt (2003:60) agreed that behavioural intent can be predicted by attitudes towards specific behaviours, which would be safety behaviour in this instance. This was confirmed in a study by Nouri *et al*. (2008:320) where social psychologists determined that attitudes are one of the crucial factors in predicting worker behaviour. The various studies, which will be discussed in the subsections below, will indicate which attitudes relate to unsafe or safe behaviour.

Fatalistic mindset

The word ‘fatalism’ refers to “an attitude of resignation in the face of some future event or events which are thought to be inevitable” ((oxforddictionaries.com, Not dated; Philosophy, 2010). Rundmo and Hale (2003) linked low engagement towards safety behaviour with this mindset. Due to the fact that fatalism is related to thought patterns and permanent worker

characteristics or factors, it does not change over time and with experience, thus impacting safety behaviour throughout the worker's career (Williamson, Feyer, Cairns & Biancotti, 1997:20).

Kouabenan (1998:244) demonstrated that fatalistic workers tend to take bigger risks, due to the fact that they possess limited knowledge of risks and accidents and the fact that they underestimate the possibility of accidents happening to them. Mainelli (2004:346) maintains that most workers fall into this category and it reflects in the way that they act towards most decisions they have to make throughout the day.

The danger of this mindset is the unwillingness to adapt to changes in the environment or to respond positively to safety interventions.

Supervisor's attitude towards workers' safety

It has been shown that workers respond with safety adherence and commitment when supervisors indicate a high level of care for their workers and commitment to both production levels and safety adherence in equal measures (Michaels & Spector, 1982:55; Sawacha *et al*., 1999:312).

Various studies confirmed the importance of supervisors' attitudes towards safety and the safety of their subordinates as crucial in unsafe behaviour, typically indicated as a direct relationship between the supervisors' concern for worker safety and workers' commitment towards workplace safety (Andriessan, 1978:364; Choudhry & Fang, 2008; Gillen *et al*., 2004:240; Hayes *et al.*, 1998:150; Iverson & Erwin, 1997:117; Langford *et al*., 2000:133; Mullen, 2004:279; Omogoroye & Oke, 2007:589; Paap, 2003:198; Simard & Marchand, 1994; Starren *et al*., 2009:7).

Workers' attitudes toward safety

Various studies have determined that workers' attitudes towards safety management determine their safety behaviour (Ball *et al*., 2009:203; Canter & Donald, 1990:112;

Choudhry *et al*., 2009:892; Choudhry & Fang, 2008:566; Cox & Cox, 1991:16; Donald & Young, 1996:13; Mullen, 2004:279; Vinodkumar & Bhasi, 2009:666).

A strong correlation has been established between workers' regard for their own safety and resulting safety performance (Sawacha *et al*., 1999:310). In one study, a group of workers explained that the fact that they had experienced injuries or near misses, made them more proactive about safety, whereas some workers were more concerned about their own reputations for doing a good job, for future selection, than they were about safety (Gillen *et al*., 2004:251).

Risk-taking behaviour stems from the workers' attitude toward safety (Fang, Chen & Wong 2006:575; Mohamed, 2002:376). An individual's work experience has been determined to influence the perception of risk associated with the job. When workers underestimate these risks, they could expose themselves and their co-workers to unnecessary danger (Mohamed, Ali & Tam, 2009:35).

From these studies, it can be determined that a positive attitude towards safety can lead to increased safety behaviour, due to the fact that workers' intentional actions are driven by their attitudes regarding their own responsibility for safety and risk perceptions of a specific job (Mohamed *et al*., 2009:35).

Workers' attitudes towards teamwork

Teamwork refers to "the combined action of a group, especially when effective and efficient" (oxforddictionaries.com, Not dated). In this regard, it refers to combined actions of construction workers on a site and workers' willingness to engage in combined action.

Several studies have confirmed the role of social interaction in adherence to safety on construction sites, indicating that being part of the team or a team player led to a lower incidence of unsafe behaviour, because of increased awareness of the potential risks within the team (Abdelhamid & Everett 2000:53, Cupido, Mitropoulos & Namboodiri, 2009; Hinze, 1981:63; Hinze 1996:380; Hinze & Gordon, 1979:255; Mitropoulos, Cupido & Namboodiri, 2009; Wright, 1986:265).

One study demonstrating this indicated that temporary workers, who were not part of the informal network of communications, were shown to be unaware of the potential risks associated with taking shortcuts in safety procedures (Iverson & Erwin, 1997:116).

Submissive attitude

A person who is submissive is "ready to conform to the authority or will of others" (oxforddictionaries.com, Not dated).

Shapira and Lyachin (2009:31) determined that workers need to have a submissive attitude as opposed to a stubborn or tenacious adherence to their own way of thinking and acting. Workers have to be willing to adhere to new policies and changes required in safety behaviour.

Workers' safety motivations

Safety motivation has been identified as a determinant of safety behaviour (Ajzen, 1991:185; Parker, Baltes, Young, Huff, Altmann & Lacost, 2003:390). It also plays a mediating role between perceptions of the psychological climate (as described in section 3.5.2) and personal and co-worker safety (Larsson *et al*., 2008:412) and regulates the effect of the safety climate on workers' participation in safety behaviour, which leads to decreases in accident rates (Neal & Griffin, 2006:945).

Extrinsic sources of motivation have been a key focus area in safety motivation research, with specific aspects such as goal setting and feedback from supervisors in relationships to perceived benefits or punishment (Lingard & Yesilyurt, 2003:60). This relates to the importance of supervisors' commitment to safety and the impact it has on workers, as was explained in section 3.5.2). The impact of workers' own beliefs and attitudes on safety behaviour also has to be taken into consideration, as it plays as important a role as the external environment (Donald, 1996:15).

3.4.4 Personality characteristics

Personality characteristics refer to “the combination of qualities that form an individual’s distinctive character”, where character refers to the “mental and moral qualities distinctive to an individual” (oxforddictionaries.com, Not dated).

Limited research has so far been conducted on the influence of workers’ personality characteristics on safety behaviour (Hansen, 1989:83). The characteristics identified in the research have been included in this study in the interest of comprehensiveness and because psychological fitness could be influenced by these aspects. Some factors have very limited research attached, but they were included to broaden the research base in this field.

Assertive

A person who is assertive is defined as “having or showing a confident and forceful personality” (oxforddictionaries.com, Not dated).

Assertiveness has been shown to enable workers to point out threats to production and safety and to prevent or correct errors made by co-workers (Cupido *et al*., 2009:888). In another study, workers expressed that, at times, they have to be assertive in demanding safer work practices, or as they called it, “taking a stand”, in conflict situations with problematic co-workers (Gillen *et al*., 2004:251).

Trustworthy

A person who is trustworthy is defined as “able to be relied on as honest or truthful” (oxforddictionaries.com, Not dated).

Flin and Burns (2004:278) highlighted three qualities relating to trustworthiness, namely ability (competence), integrity (promise fulfilment) and benevolence (care and concern). Various studies relating to the importance of these factors in trust promotion have been

conducted, illustrating the importance of trustworthiness for safety behaviour (Butler, 1991:643; Clark & Payne, 1997:205; Creed & Miles, 1996:114; McAllister, 1995:24).

Level-headed

A person who is level-headed is described as “calm and sensible” (oxforddictionaries.com, Not dated).

In a study focusing on determining the factors that affect safety on sites with tower cranes, various human character factors were pointed out as important in safety behaviour (Shapira & Lyachin, 2009:31). All the factors were placed on a bipolar scale. The positive and negative factors were examined and will be discussed in this section and the next five sections. Levelheadedness was shown to be required for safety adherence, as opposed to impulsive behaviour.

Vigilant

Recent research revealed that workers need to be vigilant or watchful and constantly aware of their own surroundings as opposed to being sluggish or lethargic, as this will have an impact on their own awareness of safety (Henning *et al*., 2009; Shapira & Lyachin, 2009:33).

Factors from “The Big Five” model

The Big Five model has been proved as an accurate descriptor of different domains of personality (Digman, 1990:196; Goldberg, 1990:1221; McCrae & Costa, 1992). The Big Five factor model is a wide-ranging, observed, data-driven research finding, through which five factors were identified and defined by numerous researchers (Digman, 1990:200), namely openness, conscientiousness, extraversion, agreeableness and neuroticism. Research has related all five factors to safety behaviour, although not always with concurrent results (Arthur & Doverspike, 2001:36; Clarke, 2006:537; Clarke & Robertson, 2005:358; Goldberg, 1990:1220; Graziano & Eisenberg, 1997:795; Henning *et al.*, 2009:338; Hogan & Ones, 1997; McCrae & Costa, 1992; Mount & Barrick, 1995:158;

Wallace & Chen, 2006:529; Watson & Clarke, 1997:229). The five factors and their impact on safety behaviour will be discussed in the next sections.

Agreeable

A person, who is agreeable, is “willing to agree to something” (oxforddictionaries.com, Not dated).

Agreeableness includes collaboration, empathy, selflessness and the ability to identify with others. Research has indicated that low agreeableness can be related to accident involvement in the workplace, as it can be related to safety attitudes (Clarke, 2006:538; Clarke & Robertson, 2005:356). In construction work, agreeable workers tend to be unselfish and this could relate to a feeling of responsibility for co-workers’ safety (Graziano & Eisenberg, 1997:795).

Extravert

An extravert is “an outgoing, socially confident person” (oxforddictionaries.com, Not dated). It has also been described as “the extent to which one seeks out, enjoys, and is confident in social situations” (Henning *et al*., 2009:338). Watson and Clarke (1997:229) revealed that highly extraverted individuals tend to be daring, outgoing, assertive and enthusiastic. Risk-taking tendencies have been linked to excitement seeking, which is a facet of extraversion.

Extreme extraversion has also been defined in terms of overconfidence, intolerance and aggression (Shaw & Sichel, 1971:7), and is associated with risk-taking behaviour, which can lead to accidents (Hansen, 1989:83; Iverson & Erwin, 1997:114; Shaw & Sichel, 1971:8).

Rosenbloom and Wolf (2002:570) stated that sensation seeking refers to the tendency to seek adventure and avoid boredom. Sensation seeking describes the optimal level of arousal and stimulation (Zuckerman, 1994:5). It entails thrill-seeking, loss of self-control, intolerance of predictable or monotonous events and tasks and willingness to take risks in

order to take part in exciting experiences (Forcier, Walters, Brasher & Jones, 2001:44; Rosenbloom & Wolf, 2002:569). Sensation seeking was found to be negatively related to adherence to safety behaviours (Ulleberg & Rundmo, 2003:430).

Contrasting to the abovementioned, in a more recent study the sociable facet of extraversion was shown to relate positively to safety attitudes, which in turn affects safety behaviour positively (Henning *et al*., 2009:338). In the study, it was also revealed that sensation seeking showed no relationship to safety behaviour and risk taking was negatively related.

Although contrasting findings exist, the main body of research agrees that extreme extraversion is negatively related to safety behaviour, due to the risk-taking factor.

Neurotic

A neurotic person is described as “abnormally sensitive, obsessive, or anxious” (oxforddictionaries.com, Not dated).

McCrae and Costa (1992) found that high levels of neuroticism related positively to anxiety, depression and insecurities. Links have also been found between low stress tolerance, which leads to attention span reduction and loss of focus at work and high levels of neuroticism (Forcier *et al*., 2001:45; Hansen, 1989:82; Shaw & Sichel, 1971:8; Sutherland & Cooper, 1991:201). This, in turn, impacts safety behaviour negatively (Hansen, 1989:82; Henning *et al*., 2009:343).

Perkins and Corr (2006:48) determined that neuroticism was negatively correlated with performance in the presence of task anxiety only when cognitive levels were low, which indicates performers who were rated the lowest, possessed high levels of neuroticism and low levels of cognitive ability.

Neuroticism would therefore be negatively related to safety behaviour when workers have low cognitive levels and if they experience elevated levels of stress or anxiety due to a lack of cognitive buffering and subsequent lack of clear decision-making (Postlethwaite *et al*., 2009:712).

Conscientious

A conscientious person is described as “someone who wishes to do their work or duty well and thoroughly” (oxforddictionaries.com, Not dated).

Mount and Barrick (1995:155) found that conscientiousness relates to dependability and the drive to achieve. In their study, Hogan and Ones (1997) also found that high levels of conscientiousness were related to cautious, rule-following, meticulous, achievement-oriented and dutiful hard workers. Another factor linked to conscientiousness includes mistake avoidance or cautiousness (Goldberg, 1990:1220; McCrae & Costa, 1992). Safety behaviour has been found to relate positively to conscientiousness (Arthur & Doverspike, 2001:36; Törner & Pousette, 2009:405; Wallace & Chen, 2006:530).

Interestingly, a few studies linked cognitive ability with conscientiousness and found that low levels of conscientiousness coupled with low cognitive levels led to increased accident rates and lower safety behaviour levels, while high cognitive and conscientiousness levels also showed high safety behaviour while workers with higher cognitive levels and low conscientiousness still showed higher safety behaviour levels (Perkins & Corr, 2006:46; Wallace & Vodanovich, 2003:316). Therefore, conscientiousness and cognitive abilities should be studied together when deciding on hiring a worker.

Open to experience

Workers with high levels of openness to experience indicate “interest in new experiences, show comfort with ambiguity and an appreciation for artistic and imaginative activities” (Tesch & Cameron, 1987:615). Individuals with high levels of openness are “forward-thinking and innovative” (McCrae & Costa, 1992). No specific relationship between this domain and safety behaviour was established (Henning *et al*., 2009:337).

Locus of control

Rotter (1954:4) conceptualised locus of control in his social learning theory by referring to it as “the extent to which people perceive contingency relationships between their actions and their outcomes”.

People “who believe that they can control their own destiny” are referred to as having an internal locus of control and those “who believe that their experiences are determined by factors outside their control” are referred to as having an external locus of control (Rotter, 1966:601). Workers, who exhibit an external of locus of control, tend to believe that accidents are not their fault (Forcier *et al*., 2001:45; Jones & Wuebker, 1993:450; MacDonald, 1973:169; Murray, Fitzpatrick & O’Connell, 1997:230).

Locus of control also relates to motivation because it determines whether the worker self-motivates (internal locus of control) or needs motivation from outside (external locus of control) to adhere to safety regulations. Motivation is crucial to ensure effective behaviour changes (Starren *et al*., 2009:8) because it inspires the intention to do something about a problem.

In consideration of the findings listed above, it can be determined that an internal locus of control relates better to safe behaviour than an external locus of control.

Type A behaviour pattern

Type A refers to a behaviour pattern or a type of personality normally related to the working environment and work behaviour. It includes factors like competitiveness, aggressive behaviour and striving for achievement (Price, 1983). Unpredictability and carelessness relating to work tasks have also been linked to Type A workers (Shahidi, Henley, Willows & Furnham, 1991:1280).

The fact that Type A workers tend to rush their work, links them to “risk taking and accident involvement” (Sutherland & Cooper, 1991:201), which could be ascribed to their increased sense of time urgency (Frone, 1998:565). Safety behaviour has been proved to be negatively related to aggression (Ulleberg & Rundmo, 2003:427). Therefore, Type A behaviour and safety behaviour are negatively related (Henning *et al*., 2009:339).

3.5 CONCLUSION

In conclusion, this chapter focused on the identified attitudes and motivation, personality characteristics, sources of knowledge and experience and perceptions and mindsets of construction workers and the impact of each factor on a worker's safety behaviour.

CHAPTER 4: RESEARCH METHODOLOGY RELATED TO THE INTERVIEWS

4.1 INTRODUCTION

Individual interviews were conducted in the field of construction by exploring the perceptions of supervisors and SMEs regarding the individual factors which could cause workers to engage in or display unsafe behaviour. The findings from the interviews will be discussed in this chapter. Three themes were identified, namely individual factors, factors regarding the supervisor's role and external factors. Subthemes were identified from the main themes. Each subtheme was linked to the relevant research regarding the factors identified.

The main objective of this part of the study was to identify the individual factors which may lead to unsafe behaviour of construction workers based on the experience and opinions of SMEs and supervisors of construction workers through interviews. From the interviews, the need arose to include external and supervisor factors as well. This was done to ensure that a comprehensive understanding of the SMEs and supervisor's view would be included in the study.

The discussion in the chapter relates to the impact of these factors on the construction workers themselves and the role of the factors in terms of unsafe behaviour, as well as the relevant research and theory which support these findings.

4.2 RESEARCH DESIGN AND METHODS

The research design for this study was selected based on the purpose statement. The research was conducted in the field of construction by exploring the perceptions of supervisors and SMEs regarding the individual factors through individual interviews. This chapter focuses on the specific research design and qualitative research methods used for data collection and analysis.

4.3 RESEARCH METHODOLOGY

The aim of this study was to develop a framework depicting the individual risk factors which could cause a construction worker to engage in unsafe behaviour. A qualitative research approach was used to achieve this.

4.3.1 Qualitative research

Qualitative r esearch has been defined as "… an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting" Cresswell (1994:25).

4.3.2 Rationale for using qualitative research for this study

The research design for this study was selected based on the purpose statement. The research was conducted in the field of construction by exploring the perceptions of supervisors and SMEs regarding the individual factors through individual interviews. Listening to and understanding views and perceptions form the basis of qualitative research and constituted the reason why this type of design was chosen. The aim of this study related to the understanding of common or shared experiences of certain individuals and thus the reason for selecting this form of research (Welman, Kruger and Mitchell, 2005:193).

It was important to understand the widely identified individual factors in order to develop a framework which would create a deeper understanding about the factors that cause workers to participate in unsafe behaviour in the South African context. To fully describe how participants view the individual risk factors, the researcher's own experiences were bracketed, as she had completed an extensive literature review on the subject. To aid within bracketing, the researcher diarised her experiences as the data gathering and analysing process developed.

4.3.3 Qualitative research advantages and disadvantages

Qualitative research results in large amounts of rich, valuable data, which could also open new areas of study for researchers, students and practitioners.

The high amount time and labour involved remains a main disadvantage of qualitative research. Bracketing of the researcher's own experiences is crucial in qualitative research, and she had to remain aware of the influence that she could have on the research and also how the research impacted on her own perceptions (Welman *et. al*, 2005:70).

4.3.4 Assumptions in qualitative research

This study made certain assumptions about the construction industry, individual risk factors, SMEs and the South African context.

An assumption is "a thing that is accepted as true or as certain to happen, without proof" (oxforddictionaries.com, Not dated). Several basic assumptions underlay the research study. As such, it was assumed that:

- all construction workers display certain individual factors which govern how they act at work;
- these individual factors are recognisable in the various studies selected to formulate the framework;
- individual factors directly impact safety behaviour on construction sites;
- SMEs and supervisors on construction sites could identify these individual factors that impact safety behaviour in construction workers and would be willing to do so for the study; and
- open interviews with supervisors would gather the required information with regard to the individual factors present in construction workers which could lead to unsafe behaviour.

The data was analysed by reducing the information to noteworthy statements or quotes and combining the statements into themes with ATLAS.ti The theory was generated by allowing it to emerge from the data rather than by using scripted categories or guidelines (Glaser, 1992). Thereafter, the researcher developed a written account of the experiences

of the supervisors and SMEs while considering the context of their experiences, and formulated a combination of the descriptions to describe the essence of the experience.

4.3.5 Grounded theory as approach

The research paradigm that framed this study was grounded theory through constructivism/interpretivism. The aim was to discover the theory implicit in the data, ensuring that the emerging theory was adequate by making sure that it matched the situation and that it worked, or was appropriate to allow the people in the situation to understand their own experiences (Glaser, 1992:52; Maree, 2007:77).

The ontology of this paradigm was focused on the reality constructed by humans through interaction, in order to interpret and construct multiple subjective meanings (Rice & Ezzy, 2002:20). In terms of epistemology, through this paradigm the researcher aimed to understand events through interpretation, influenced by interactions with the subjects (Charmaz, 2006:6). In this study, the methodology was qualitative and based on a systematic literature review and interviews conducted with SMEs and supervisors by interpreting their particular contexts and developing a framework based on the data by means of theory building (Maree, 2007:77).

4.3.6 Steps in grounded theory research

Glaser and Straus (in Maree, 2007:77) proposed four steps in the process for grounded theory development. Firstly, data collection is conducted through interactions with the participants, which was done in the form of open guided interviews in this study. Secondly, the data analysis process was focused on constant comparison of gathered data, which gave way to coding and grouping of the identified similarities and differences between data sets or, as in this instance, interviews. This was done in order to – thirdly – identify core factors, which then led to the search for more information on the factors, which continued until no new information could be obtained from the data. Fourthly, resulting from this process, theory definition was attempted. This comprised a rich, powerful description of the investigated factors, in this case, the individual factors which cause construction workers to partake in unsafe behaviour as identified by the interviewees.

4.4 INQUIRY STRATEGY AND RESEARCH DESIGN

Inquiry strategy for this study was a pure, non-empirical, qualitative research design based on a systematic review of available literature and open-ended guided interviews, in order to develop a framework of individual factors which lead to unsafe behaviour in construction in South Africa (Mouton, 2001:25). The study comprised a non-experimental analysis of secondary textual data, interview data and relevant literature based on an interpretivist approach.

Qualitative research emphasises understanding by considering people's words, actions and records. The patterns of meaning which emerged from the data were reviewed and presented so that others (peers and colleagues) could inspect it. At the same time, the original meaning of the constructed world of the participants was adhered to (Maree, 2007:79).

The main aim of this study was to explore the individual factors of construction workers which led them to be more willing to partake in unsafe behaviour on construction sites in South Africa. The experiences of different people (SMEs and supervisors) were bracketed, analysed and compared to identify the real meaning of the experienced reality. The researcher was faced with the challenge to enter the working world of her participants and understand their world from their point of view (Maree, 2007:79; Saunders, Lewis & Thornhill, 2007:25).

The participants in the study were carefully chosen to be individuals who were presumed to be able to identify the factors due to their extensive experience and great amount of time spent within the construction and risk assessment fields.

4.5 PHASES OF THE RESEARCH PROCESS

Separate distinguishable phases were used in this research process and are discussed in this section.

4.5.1 Conceptual phase

The researcher identified an area of interest for the study during this phase and conceptualised a research problem, which was then processed to identify the research objective. The researcher conducted a systematic literature review as part of the research inquiry.

Research problem

In Chapter 1 (section 1.1), the introduction to the research problem was explained in terms of a background to the field and the problem identified. The problem statement is set out in Chapter 1 (section 1.2).

Research objectives

Chapter 1 (section 1.4) explains the objectives of this research.

Literature review

In this study, the literature review study formed part of the research design and supported the identification of the research problem. It guided the researcher towards the type of questions to be asked during the individual interviews to enable her to obtain a more specific view and interpretation of the SMEs' and supervisors' perceptions. Chapters 2 and 3 present the literature review. The data provided in Chapters 2 and 3 formed part of the framework and the process followed was cyclical. When new factors were identified in the interviews, the literature was revisited to provide support for the factors and to determine the relevance of the specific factors to the industry.

4.5.2 Design and planning phase

During this phase the research approach was determined as a qualitative approach, with individual interviews as the data collection method. The data gathering instrument, in the form of an interview schedule was designed and the sampling design was selected.

Background to the study

The accident, injury and fatality rates in construction are higher than those of most other industries (Carter & Smith, 2006:199; Choudhry *et al.*, 2008:24; Hinze 1997:105; Kines, Spangenberg & Dyreborg, 2007:54; Mthalane *et al.*, 2008:2; Sawacha *et al.*, 1999:310).

In the South African context, research has found that indirect costs can be as much as 14 times the direct costs (Smallwood, 2000:26). South African construction companies have to adhere to Section 15(12)(a) of the amended Occupational Health and Safety Act (85/2003), which states, “A contractor shall ensure that all employees required to work or to be supported on a suspended platform are physically and psychologically fit to work safely in such an environment by being in possession of a medical certificate of fitness.”

The primary focus of the academic literature on this topic has been processes of safety management regarding aspects such as the safety procedures and policies, management’s responsibilities and roles regarding construction safety and adherence to safety measures, technological aspects and other factors in the external environment of the construction worker. Research into factors which could impede a worker’s sound state of mind is limited. South African research in this specific field is especially limited.

Grounded theory calls for a focus on background and the participants’ context in terms of a qualitative research approach to obtain data (Maree, 2007:77). Background and context in this instance refer to the physical areas or situations in which the research is conducted. The researcher needed to understand the participants’ context in terms of the South African construction industry and the factors pertaining to it, such as time and availability.

The background or context of this study is that the South African construction industry is faced with high accident rates and limited knowledge on the factors within the individual construction worker which could impede safely behaviour and cause higher incidences of accidents.

Descriptive design

Descriptive design features were used to describe and observe the phenomenon relevant to the study and then code the findings. With this design, the focus is on little or no interference with the context and situation in order to form a comprehensive image of the phenomenon experienced by the participants and to obtain complete and meaningful information (Polit & Hungler, 1993:20).

In the current study information about the individual factors of construction workers which could obstruct safety behaviour was gathered. The data obtained in this research from the literature and the individual interviews was used to create an descriptive account. The researcher did not interfere with this process.

Exploratory design features

An exploratory design was used in this study for the problem identified by the researcher. New ideas and opinions or insights are unearthed in this type of design and a flexible approach is required. Limited literature was available on the South African context and the researcher had to rely on international research. The direction of this study was guided by the literature and the data, and the process was cyclical. Open-ended, probing and clarifying questions were used and the answers allowed the researcher to conclude the study, and will most probably also allow for further studies on the topic.

Data gathering process

The researcher conceptualised a plan to gather the data. Four interviews with SMEs and three interviews with supervisors were conducted, following which the researcher found that data saturation had occurred. Interviews were used to investigate the ideas and perceptions of SMEs and supervisors in the interest of conceptualising a framework for the South African construction environment. Since the study was an open-ended guided plan, the researcher went into to the field with limited knowledge of what to expect.

There are different types of interviews, namely informal, structured and guided (Grbich, 1999:199, Welman *et al*., 2005:71). In an informal interview, the interviewer structures the interview and chooses the specific topic. With structured interviews, the interviewer is bound to questions that are predefined, which could limit the objectives. During a guided interview, the researcher uses guiding questions because the phenomena being researched consist of broad factors. Participants are urged to explain their observations and experiences in a specific situation and the interviewer is free to explore any issue that may arise. During this study, open-ended, guided interviews were used.

The disadvantage of interviews is that they are time-consuming and less cost-effective than say, surveys. The interviewer and participant could also misinterpret each other's statements or struggle to understand each other, even when they speak the same language. An advantage is that interviewing is regarded as a trustworthy method as the participants are the direct sources of the data, allowing for clarification and expansion of topics by the researcher. The researcher can also observe verbal and non-verbal communication throughout the process and build relationships with the participants (Kothari, 2001:44; Welman *et al*., 2005:72).

- The role of the researcher

The researcher's role in the process was to encourage the participants to talk unreservedly by utilising skills such as interest, listening, focus, emotional intelligence and enthusiasm (Grbich, 1999:209; Maree, 2007:87). She also had to be aware of her own limitations, strengths, values, feelings and the impact of these on participants. Throughout the process, the researcher focused on being the instrument in the data gathering process, not the subject.

- Guiding questions

Open-ended guiding interviews were conducted to determine the views of supervisors and SMEs regarding individual factors which they thought could lead to unsafe behaviour on construction sites. This type of interview helped to clarify concepts and understand the

issues as experienced by the supervisors themselves (Minichiello, Aroni, Timewell & Alexander, 1990:251; Maree, 2007:88).

One of the disadvantages of open interviews applicable to this study is the possibility of display bias from the researcher (Welman *et al*., 2005:73). In this instance, the researcher performed an extensive literature search on the topic and the information came mostly from international construction companies. The researcher was aware of this framework and worked throughout to ensure that the international situation did not cloud her view of the South African situation by keeping an open mind and an awareness of her own prior knowledge. In Atlas.ti, the researcher continuously wrote memos on her own perceptions and emotions that could have influenced the process. The researcher also made notes on the differences between the international and South African construction environment. Time constraints were also taken into consideration, as the supervisor and SMEs had limited time available. Based on the results of the first interview, the emerging data shaped the rest of the data gathering process (Charmaz, 2006:42).

During the individual interviews, probing questions were not meticulously followed in the same order that the researcher had prepared them. There were some instances where the participants discussed factors pertaining to the external environment or the supervisor's role, upon which the researcher formulated the probing questions on the basis of this information.

Probing questions are used to give structure to interviews and to obtain information, but the researcher had to remember that these questions could not be used as a strict formula (Polit & Hungler, 1993:18). A copy of the scheduled guiding questions is annexed to this thesis as Annexure B.

- Question specifics

In this research study, the researcher felt the need to ask open-ended questions, probing questions and clarifying questions, which enabled the participants to express their views and perceptions without any limitations (Grbich 1999:200).

During the interviews, different types of questions were asked. Main questions were asked which were based on the interview schedule. Probing questions were used to encourage the participants to elaborate further on a certain factor if the researcher could see that the participant needed clarity on the question content. Clarifying questions were asked when the researcher needed to understand a specific factor emphasised by the participant.

4.5.8 Data gathering

The data gathering process that was used in this research study comprised of the following steps (Maree, 2007:72):

- A digital recorder was used for the interviews to record the data and notes were taken throughout the interviewing processes so that they could later be compared to what was coded, to guard against possible omissions of parts of the interview process (Grbich 1999:210; Maree, 2007:88).
- The researcher made a list of different topics. Topics that were similar were grouped together and then grouped into “individual factors”, “supervisor” and “external environment”.
- The different topics were abbreviated as codes.
- The expressive wordings which occurred most frequently for the different topics were analysed and changed into themes.
- A final decision on the wording for the different themes was made and from this the researcher identified subthemes.

4.5.9 Interview questions

The main open-ended questions that were asked during the interviews with the SMEs and the supervisor were:

- Are there other factors which you would consider problematic in terms of adherence to safety procedures?
- Are there preventative measures in place to ensure workplace safety?
- How do you in the industry identify the root causes of accidents?

- How does a person's individual behaviour feature in safety?
- How does behaviour feature in the risk assessment process?
- In the construction industry, whose behaviour contributes the most to unsafe behaviour?
- Please can you identify the psychological factors that may lead to unsafe behaviour?
- Please can you name the specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?
- What would you classify as unsafe behaviour on a construction site and how would you identify it?

The probing and clarifying questions that were asked during the interviews with the SMEs and the supervisor were:

- Are there specific individual factors in construction workers that you have identified during accident investigations, which always seem to be present when an accident is caused by unsafe behaviour? (For example, quick temper, aggressive tendencies, etc.) Please name these factors and describe the situation in which they occurred.
- How do you identify unsafe behaviour?
- In other words; which factors could cause them to engage in unsafe behaviour on the construction site?
- What is PPE?
- When you speak of cultural factors, which factors are the most influential in that regard?
- Which personality factors or characteristics of construction workers would you consider problematic in terms of their adherence to safety regulations? (In other words, which factors could cause them to engage in unsafe behaviour on the construction site?)

4.5.10 Sampling

The sampling process used was criterion sampling, as a relatively small sample size was needed, due to the fact that, in qualitative research, statistical analysis, control and generalisation are unnecessary (Maree, 2007:79). The participants also had to have experienced the unsafe behaviour in order for them to understand the focus of the study and to aid the researcher in finding the information required. The sample consisted of experts and supervisors willing to partake in the research. They were chosen based on their ability to explain their experiences to the researcher and the fact that they had been exposed to the investigated phenomenon (Streubert & Carpenter, 1995:25).

The population, from which the sample was taken, was construction industry experts (SMEs) and supervisors who had experience of unsafe behaviour of workers. The sample size was determined by the emerging data or when data saturation was reached. The characteristics of the participants were noted in the data. The supervisor and SMEs were traced through various contacts in the construction and industrial psychology fields. They were interviewed at their places of work and at locations suitable to their needs.

4.6 DATA ANALYSIS

In this phase, the interviews were recorded and typed verbatim and analysed thematically with the use of ATLAS.ti qualitative data management software, which is a code-based theory-builder which in essence becomes an extension of the researcher (ATLAS.ti, version 6.1, 2010, ATLAS.ti GmbH, Berlin, Germany). Data was arranged, formulated and presented logically in order to summarise the findings. In qualitative research, this is challenging because no clear guidelines on data analysis exists and a small sample from the population was used (Rice & Ezzy, 2002: 25).

4.6.1 Procedure

Considerations which had to be taken into account included researcher bias and conscious awareness on how this could affect the study. The researcher interviewed SMEs and supervisors of construction workers with a predetermined interview schedule. The interviews were recorded and transcribed verbatim by the researcher. Notes and comments were added with the use of the memo function in ATLAS.ti, which enables a

cyclical process necessary in grounded theory research, by aiding the researcher to remain objective through documenting her own ideas and perceptions which might influence the findings. This software was used because of its ability to explore complex phenomenon which might be hidden in the qualitative data and the fact that it is one of the most powerful qualitative analysis software available. It allows for contextual analysis of graphic, textual and auto data (Friese, 2011:3).

Preliminary analysis was conducted by assessing and interpreting the data and sorting it into broad categories (Baxter & Jack, 2008:550). Hereafter, thematic analysis was conducted by identifying recurring themes and ideas from the transcript and coding them with applicable concepts within ATLAS.ti The researcher conducted interviews with SMEs and supervisors of construction workers until she reached data saturation.

4.6.2 Research considerations

Considerations which were taken into account for this study are discussed in this section. Ethical considerations are discussed as Chapter 5, as it underpins the whole study and not merely the content of Chapter 4. It is done in this manner to ensure that the ethical considerations are emphasised and considered for the interview findings and the research phases.

Trustworthiness

Quantitative research studies are evaluated through means of reliability and validity, whereas qualitative studies are evaluated through the concept of trustworthiness (Guba, 1981:78; Lincoln & Guba, 1985:80; Welman *et al*., 2005:172). Trustworthiness is established when the research can be accepted as being true, which is established through the criteria called credibility, dependability, confirmability and transferability (Baxter & Jack, 2008: 557).

Confirmability is the degree to which the findings in the study reflect the focus of the original enquiry (Lincoln & Guba, 1985:80). An audit trail enabled the researcher to keep track of the method through which the various interpretations and conclusions were

formulated. In the form of reflexivity, the researcher made her own opinions and ideas known to the reader through the use of memos in ATLAS.ti in order to reduce her own bias.

Dependability occurs when the researcher allows for ongoing change within the participants' contexts and the passage of time (Guba, 1981:81), which might not allow for the study to be replicated elsewhere. Therefore, qualitative studies cannot be held to the principle of repeatability, as found in quantitative research, due to the nature of qualitative research and the need for flexibility within the process. The detailed explanation of the research method will determine how repeatable or in fact, unique this study is.

Credibility implies that the findings are believable from the perspectives of the SMEs and supervisors. The main purpose of this study was to describe and understand the factors identified by the SMEs and supervisors through the interviews and only they can determine the subsequent credibility of the study ((Guba, 1981:81; Charmaz, 2006:114). In order to ensure credibility of the study, peer reviews of the findings were conducted, as well as discussions with colleagues in different contexts. Data was gathered from participants in different areas of construction, contradictions between participant responses were considered and member checking regarding the framework was done with selected participants.

Transferability in qualitative research points to the fact that findings are not supposed to be generalised, because of the content specific nature of the findings. The systematic literature review was used as support for the interview findings and vice versa. From the results, some of the factors can be seen to be more generally applicable to the international construction community, whereas some of the factors identified in the interviews would be more specific to the South African environment.

The researcher adhered to these considerations throughout and provided an audit trail for the interviews and data collection consisting of detailed, thick descriptive data to enable others to determine the applicability of the data to their own situation or contexts (Petty, Thomson & Stew, 2012:382).

4.7 CONCLUSION

The next chapter describes the ethical considerations taken into account during the qualitative research process, specifically in terms of the analysis of data gathered through the interviews. In qualitative research, adherence to ethical considerations is crucial in order to protect the rights of the people being interviewed and cannot be overstated. The chapter is added to this part of the study, because it was taken into consideration throughout the design phases and constantly adhered to within the data analysis phase of the study, Chapter 6.

CHAPTER 5: ETHICAL CONSIDERATIONS FOR THE STUDY

5.1 INTRODUCTION

The nature of ethical considerations in qualitative research are more complex than in quantitative research, due to the fact people's experiences in life and their opinions and ideas regarding those experiences are being investigated (Holloway & Wheeler, 1996; Maree, 2007:80; Silverman, 1989; Welman *et al*., 2005:70). The three principles of the Belmont Report was followed, namely beneficence, respect for human dignity and justice (Polit, Beck & Hungler, 2001:15). These principles are discussed below. The researcher's own involvement in the study was discussed in detail in chapter 4 and will be briefly covered in section 5.2.

5.1.1 Principle of justice

Right to privacy

The right to privacy entails that SMEs or supervisors could decide which personal information they wanted to share and under which conditions (Welman *et al*., 2005:201) Informed consent was obtained from each participant in the form of a letter of consent,

which had a cover page detailing the aim of the study and contact details for the relevant parties involved in the research, as well as the information regarding access to the study and confidentiality of the participants was assured. This was done at the start of the interview, during the introduction phase.

Right to fair treatment

A mutual agreement existed with regard to the researcher's role and the participants' roles in the study. The SMEs and supervisors' right to fair treatment was established by the informed consent form, which they were asked to sign before the interview took place. All participants signed the form and were informed of their rights during the process. Individual and cultural diversity was respected by the researcher (Polit & Hungler, 1993:12; Welman *et al*., 2005:101).

5.1.2 Principle of beneficence

Freedom from harm

The researcher made sure that all necessary steps were taken to reduce all dangers to the subjects involved in the study, including loss of self-esteem, stress or economic harm of the participants (Bryman, 2001:475; Polit *et al*., 2001:16; Welman *et al*., 2005:101). Although it was unlikely that any harm would occur, it was anticipated that the SMEs and supervisors would dislike some of the questions asked and would rather avoid them, which proved true on the part of some of the supervisors. After the researcher had obtained the informed consent from the SMEs and the supervisors, the anticipated duration of the interview was communicated to ensure the risk of economic harm due to time constraints was addressed. The duration of the interviews remained within the time limits that were set.

Freedom from exploitation

The researcher ensured freedom from exploitation by making neccessary precautions to prevent any abusive or disrespectful treatment of the subject in the study. The only risk of

exploitation in the study involved the time usage (Polit & Hungler 1993:13). The researcher explained the amount of time that the interview would take when the interviews were arranged and the SMEs and supervisors agreed to this time frame.

The benefit/risk ratio

This ration refers to the weighing up of risks and benefits involved in the study (Polit & Hungler 1993:13). The SMEs and supervisors in this study were informed of the possible risks and benefits. In the long run, the benefits of this research study are that construction workers can be evaluated for risk factors, which could decrease the instance of unsafe behaviour on construction sites. The possible risks in this research study were that the SMEs and supervisors could be uncomfortable talking about risk factors they had witnessed or about their own role in the process. The researcher respected this and did not push for answers when they were unwilling to provide them.

5.1.3 The principle of respect for human dignity

The right to full disclosure

Participants have the right to full disclosure and this was established by the researcher by means of informing the SMEs and supervisors about the purpose of this research study in the form of a cover letter with that information which was attached the letter of consent signed by each participant (Polit & Hungler, 1993:15).

Informed consent

The SMEs and supervisors participated voluntarily in the study (Silverman 1989). The SMEs and supervisors in this research study were informed that the aim of this study is to enable the researcher to develop an individual risk factor framework. The estimated duration of the interview was communicated to them as approximately one hour. The SMEs and supervisors were asked to answers the questions asked by the researcher as accurately and truthfully as possible. The SMEs and supervisors agreed to have the interviews recorded and to have written notes made of their responses. The researcher

also communicated her willingness to provide the SMEs and supervisors with a summary of the research study once completed. Appreciation for the time and responses of the participants was communicated by the researcher, along with assurances of confidentiality and their rights as participants (Welman *et al*., 2005:101).

The right to self-determination

The SMEs and supervisors could decide whether they wanted to be involved in this research study or not, without intimidation. In line with the recommendation by Polit and Hungler (1993:17), the SMEs and supervisors were informed that they had the right not to reveal information to specific questions, to withdraw themselves from the interview at any time and to ask for clarity if a question was not clear to them at any time during the interview.

5.1.4 Involvement of the researcher

The researcher guarded against manipulation of respondents and against treating them as objects or numbers instead of as human beings deserving of respect and having rights as indicated in section 5.1.1 up to section 5.1.3 (Welman *et al*., 2005:101). Unethical tactics or techniques were not used when interviewing and all respondents were treated as equals and each opinion was valued as being important to the data gathering process.

5.2 CONCLUSION

The ethical considerations discussed in this chapter were adhered to by the researcher during the data gathering process through interviews and the data coding and analysis which are discussed in the next chapter.

CHAPTER 6: INTERVIEW FINDINGS AND THE THEORETICAL FRAMEWORK

6.1 INTRODUCTION

From the SMEs' and supervisors' answers to the interview questions and the researcher's ensuing analysis of the data and coding through Atlas.ti, the following themes emerged (the themes and subthemes are contained in Appendix D):

- Individual factors
- Supervisor's role
- External factors

The factors identified through the interviews were linked to the systematic literature review where applicable. When new factors emerged, which were not addressed in the systematic literature review, sources were added to explain their relevance to the study.

The responses from the interviewees were taken verbatim, therefore grammatical or language errors were not corrected, to ensure a true account of the responses. When a worker is referred to by a respondent in the male form, this study assumes that it is relevant to both male and female construction workers and not limited to either gender.

The coding for the supervisors (S01, S02 and S03) and the SMEs (SME01, SME02, SME03 and SME04) were used to protect their identities and to differentiate between the respondents.

The responses were orientated to the study by means of a cover letter, stating the aim and objectives of the study and they were asked to sign a letter of consent, detailing their rights and emphasising the protection of their identities. Every respondent signed the letter.

In order to enable the respondents to understand the nature of the interview and what is investigated in the study, the researcher explained the four categories of psychological factors used in the study, namely knowledge and experience factors, perceptions and mindsets, attitudes and motivations and, finally, personality characteristics.

6.2 Theme 1: Individual factors

The participants were not always identify specific psychological factors which cause workers to engage in unsafe behaviour, but probing questions helped them to name certain characteristics which could be categorised as psychological factors, as per the categories of this study which were explained to them in the introduction to each interview.

The findings support various factors identified through the systematic review of literature, like education, accountability, perceptions of masculinity, alcohol abuse and commitment towards safety. New factors which were identified by the participants include workers' lack of awareness of safety processes and procedures, wilful negligence in order to claim for compensation, workers' culture, the wearing of safety gear and physical abilities, which in themselves are not psychological aspects, but can be categorised as individual factors which has been researched substantially.

The answers to the following main, probing and clarifying questions gave rise to theme 1:

- **Main question:** Are there other factors which you would consider problematic in terms of adherence to safety procedures?
- **Main question**: Are there preventative measures in place to ensure workplace safety?
- **Main question:** How do you in the industry identify the root causes of accidents?
- **Main question:** How does a person's individual behaviour feature in safety?
- **Main question**: How does behaviour feature in the risk assessment process?
- **Main question:** In the construction industry, whose behaviour contributes the most to unsafe behaviour?
- **Main question:** Please can you identify the psychological factors that may lead to unsafe behaviour?
- **Main question:** Please can you name the specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?
- **Main question:** What would you classify as unsafe behaviour on a construction site and how would you identify it?

- **Probing question used:** How do you identify unsafe behaviour?
- **Probing question:** Are there specific individual factors in construction workers that you have identified during accident investigations, which always seem to be present when an accident is caused by unsafe behaviour? (For example, quick temper, aggressive tendencies, etc.) Please name these factors and describe the situation in which they occurred.
- **Probing question:** Are there specific individual factors in construction workers that you have identified during accident investigations, which always seem to be present when an accident is caused by unsafe behaviour? (For example, quick temper, aggressive tendencies, etc.) Please name these factors and describe the situation in which they occurred.
- **Probing question:** When you speak of cultural factors, which factors are the most influential in that regard?
- **Probing question:** In other words; which factors could cause them to engage in unsafe behaviour on the construction site?
- **Clarifying question:** What is PPE?

This theme unfolded in the following subthemes:

- Subtheme 1.1: Workers' accountability
- Subtheme 1.2: Workers' perceptions about masculinity
- Subtheme 1.3: Alcohol and substance abuse by workers
- Subtheme 1.4: Workers' attitudes and commitments towards safety
- Subtheme 1.5: Workers' physical abilities
- Subtheme 1.6: Workers' culture
- Subtheme 1.7: Workers' level of education
- Subtheme 1.8: Workers' safety awareness
- Subtheme 1.9: Workers' mental state

6.2.1 Subtheme 1.1: Workers' accountability

The main questions relating to workers' accountability and their answers, as well as the probing questions and resulting answers are displayed in Table 5.

Table 5: Questions and answers relating to workers' accountability

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Accountability for wearing safety gear	SME03: Look, he has a certain code he has to adhere to in terms of safety gear and uniform, like hard hats and boots with steel toes. There are a lot of things like harnesses above 1.5m.
Accountability for adhering to safety regulations	S01: They also implement regulations that the employee see as ridiculous and has no relevance to his situation. I have also noticed that employees do not comply with the risk assessment because it is a hassle to them … employees do not implement the training that they received … In my personal experience, I have found that employees do not take responsibility for their own actions … I have also noticed that employees do not comply with the risk assessment because it is a hassle to them … employees do not implement the training that they received. SME02: There is a perception that for any type of injury, they qualify for compensation, that is what they believe, there are people who willingly injure themselves to qualify for compensation, like the wearing of hearing protection – they don't wear it because, if you lose 20% of hearing, you qualify for compensation, but you can still talk and hear. So they wilfully engage in unsafe behaviour to obtain compensation. SME03: He has to be willing to comply with

	the rules and do as he is told. S02: I think psychological factors go hand in hand with discipline, to respect and adhere to it.
Probing question: Are there specific individual factors in construction workers that you have identified during accident investigations, which always seem to be present when an accident is caused by unsafe behaviour? (For example, quick temper, aggressive tendencies, etc.) Please name these factors and describe the situation in which they occurred.	
Accountability for wearing safety gear	S01: The accidents that I have seen were injuries to fingers, legs eyes etc. The workers did not wear the PPE as required
Clarifying question: What is PPE?	S01: Proper precautionary equipment.
Probing question: Are there specific individual factors in construction workers that you have identified during accident investigations, which always seem to be present when an accident is caused by unsafe behaviour? (For example, quick temper, aggressive tendencies, etc.) Please name these factors and describe the situation in which they occurred.	
Accountability for adhering to safety regulations	S01: In my personal experience, I have found that employees do not take responsibility for their own actions.
Main question: What would you classify as unsafe behaviour on a construction site and how would you identify it?	
Accountability for adhering to safety regulations	SME02: It is anything that a person was trained on, but is not doing what the law requires according to legislation SME03: Not following procedures or adhere to training in terms of safety procedures. S03: The behaviour is easy to identify if you know the procedures and you look at what the workers are doing.
Accountability for wearing safety gear	SME02: The other category is pure wilful, intentional negligence. The person is

	working at night, he knows management is not there and he ignores the safety procedures and does not wear his safety gear. S02: The worker must wear PPE at all times.
Main question: How does a person's individual behaviour feature in safety?	
Accountability for adhering to safety regulations	SME01: Task behaviour can also be done either with compliance or non-compliance with the rules. Often, non-compliance is because of the supervisor's attitude toward safety checks; he wants to get the job done and he doesn't check anything. SME02: People walk past unsafe conditions and decide it's not my problem. S03: They can become negligent, which could lead to an accident, as they are working on raised platforms. SME04: Each person's safety results in an overall safety classification, so it is either safe or unsafe
Accountability towards co-workers	SME01: And this works in the way that when risky tasks have to be completed, co-workers check each other to adhere to the safety behaviours required for the task. SME02: I think on average, if you look at all people working in industry, in my opinion 50% of them – unacceptable behaviour. And it's not just wearing protective gear, but the most important aspect is the obligation on everyone to report unsafe conditions and behaviour. SME03: ..they start making jokes, pushing

	each other around.
Accountability for wearing safety gear	SME02: And it's not just wearing protective gear. S02: The guys ask you why he should wear his safety gear if you don't wear yours.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Accountability towards co-workers	SME01: It might also be peer pressure, because it's your work mates and if you don't do it, they might treat you as an outcast or not want to share the bonus with you or it may hamper your working relationship with time. And if he doesn't want to work, the boss might ask why and then they will have to admit that they worked while there was a gas leak. So peer pressure has a lot of power when it comes to behaviour. But peer pressure can also work the other way around, in a good way, where a few guys want the money, but the rest refuse because they know it's too risky.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Accountability towards co-workers	SME04: Another factor is teamwork and within teams if the workers supported each other to do their work more safely and taking responsibility for your own safety as well as that of others
Main question: In the construction industry, whose behaviour contributes the most to unsafe behaviour?	
Accountability for adhering to safety regulations	SME04: The worker's behaviour in terms of his knowledge of safety regulations and his adherence to it.

Main question: How do you in the industry identify the root causes of accidents?	
Accountability for wearing safety gear	SME04: Once we had a case where a worker was not wearing a harness and he fell from a platform.

Discussion

From the data gathered, it was evident that the participants agreed that workers have to be accountable for safety in the workplace in terms of:

- being accountable for wearing their safety gear;
- being accountable for adhering to safety regulations; and
- being accountable for the safety of their co-workers.

The participants, specifically the supervisors emphasised that a main cause of accidents was negligence on behalf of the worker in terms of the wearing of safety gear and adherence to safety regulations.

The results support the views of the following authors with regard to the importance of worker accountability for safety:

- Various studies confirmed these findings by stating that workers' own accountability for safety management determines safety behaviour (Ball *et al*., 2009:203; Canter & Donald, 1990:112; Choudhry *et al*., 2009; Choudhry & Fang, 2008:566; Cox & Cox, 1991:16; Donald & Young, 1996:205; Fang *et al*., 2006:580; Gillen *et al*., 2004:234; Mohamed, 2002; Mohamed *et al*., 2009:30; Mullen, 2004:278; Sawacha *et al*., 1999:309; Vinodkumar & Bhasi, 2009:662).

From these studies, it can be determined that workers can be held accountable for their own and co-workers safety in terms of adherence to safety regulations.

6.2.2 Subtheme 1.2: Workers' perceptions of masculinity

Some of the probing questions led to answers regarding workers' perceptions of masculinity and its effect on safety behaviour. The answers are displayed in Table 6.

Table 6: Questions and answers relating to workers' perceptions of masculinity

Main question: How does a person's individual behaviour feature in safety?	
Macho attitude	SME01: And unfortunately, there is the macho thing of wanting to finish the job as quick as possible and bragging about it. S01: It depends on what their culture says about what it means to be a man. If they have issued with that, they won't wear the PPE.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Cultural aspects regarding manliness	S01: I think if you look at the majority of workers and you study or analyse the culture they come from, they are not used to wearing safety gear. We had one instance where a young black guy, hard worker, very committed, was not wearing his safety glasses.

Discussion

From the data gathered, workers' perceptions of masculinity do play a role in the South African construction environment in terms of:

- a macho attitude
- cultural aspects regarding manliness.

The results support the views of the following authors with regard to the role that workers' perceptions of masculinity play in unsafe behaviour on construction sites:

- Various studies have indicated that the perception of masculinity is linked to various factors which contribute to unsafe behaviour, like horseplay and aggression, specifically in the construction industry (Cheyne *et al*., 1998:3; Choudhry & Fang, 2008:566; Connell, 1995; Gillen *et al*., 2004:233; Hayes, 2002:1918; Iacuone, 2005:247; Lynch, 1997:75; Mullen, 2004:280; Paap, 2003:197; Starren *et al*., 2009:5).
- Hopkins (1995:140) argued that class position rather than masculinity conditioned workers' thinking.
- Recent research by Iacuone (2005:265) and Choudhry and Fang (2008:576) determined that the concept of wanting to be perceived as a "tough guy" caused some workers to behave unsafely. While workers behaved safely during training, on site, they encouraged each other to take on risky tasks in order to seem brave and tough. In these instances, workers also avoided wearing protective gear, as they were afraid of being teased by their co-workers.
- Another study revealed that individuals would take greater risks and partake in unsafe work behaviour if it meant that it would improve their image. They would go to great lengths, e.g. avoid using safety equipment and wearing protective gear, to ensure that others would perceive them as "macho" or manly (Mullen, 2004:279).
- Fear of teasing and harassment by co-workers also cause workers to avoid wearing protective gear (Mullen, 2004:280).
- Co-worker intimidation or ridicule has been proved to cause workers to not adhere to safety regulations (Gillen *et al*., 2004:252).

6.2.3 Subtheme 1.3: Alcohol and substance abuse by workers

Some of the probing questions led to answers regarding alcohol abuse by workers and its effect on safety behaviour. The answers are displayed in Table 7.

Table 7: Questions and answers relating to alcohol and substance abuse by workers

Main question: How do you in the industry identify the root causes of accidents?	
Cause of accident alcohol abuse	SME01: And (you continue to ask) why, why why, like in the use of drugs or alcohol, now they tell you the guy was drunk, he drove

	the company vehicle and crashed into a pole.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Cause of accident alcohol abuse	S01: The one accident was the result of alcohol use by the injured worker. SME04: ..not just alcohol, drugs especially. The guys are known to smoke marijuana after hours and even while working and that makes a big difference.
Main question: How does behaviour feature in the risk assessment process?	
Impact of alcohol abuse	SME03: If a worker is willing to abuse alcohol it can affect his safety behaviour

Discussion

The participants indicated that substance and alcohol abuse can be linked to accidents with regards to the causes or events leading to the accident.

The results support the views of the following authors with regard to the impact of alcohol abuse by workers on accident rates in the construction environment:

- The use and abuse by workers of substances such as alcohol and drugs on construction sites lead to unsafe behaviour and it has also been proved to be the lead cause of death due to accidents on construction sites (Khanzode *et al*., 2012:1361; Lipscomb, Dement & Rodriguez-Acosta 2000:572; Pollack, Franklin, Fulton-Kehoe & Chowdhury, 1998:575).
- Garret and Teizer (2009:761) determined that intentional unsafe acts do occur due to various reasons, such as financial problems, grudges against co-workers or supervisors and substance abuse.

6.2.4 Subtheme 1.4: Worker's attitudes and commitment to safety

The main questions relating to workers' attitude and commitment to safety and their answers, as well as the probing questions and resulting answers are displayed in Table 8.

Table 8: Questions and answers relating to worker's attitudes and commitment to safety

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Safety seen as a hassle	S01: They also implement regulations that the employee see as ridiculous and has no relevance to his situation … I have also noticed that employees do not comply with the risk assessment because it is a hassle to them.
Wilful negligence for compensation	SME02: There is a perception that for any type of injury, they qualify for compensation, that is what they believe. There are people who willingly injure themselves to qualify for compensation, like the wearing of hearing protection – they don't wear it because, if you lose 20% of hearing, you qualify for compensation, but you can still talk and hear. So they wilfully engage in unsafe behaviour to obtain compensation.
Accountability for wearing safety gear	S01: The workers did not wear the PPE as required.
Accountability for adhering to safety regulations	S01: They also implement regulations that the employee sees as ridiculous and has no relevance to his situation. I have also noticed that employees do not comply with the risk assessment because it is a hassle to them … employees do not implement the training that they received … In my personal experience, I have found that employees do not take responsibility for their own

	actions … I have also noticed that employees do not comply with the risk assessment because it is a hassle to them … employees do not implement the training that they received. SME02: There is a perception that for any type of injury, they qualify for compensation, that is what they believe, there are people who willingly injure themselves to qualify for compensation, like the wearing of hearing protection – they don't wear it because, if you lose 20% of hearing, you qualify for compensation, but you can still talk and hear. So they wilfully engage in unsafe behaviour to obtain compensation.
Main question: What would you classify as unsafe behaviour on a construction site and how would you identify it?	
Wilful negligence for compensation	SME02: The other category is pure wilful, intentional negligence.
Accountability for adhering to safety regulations	SME02: It is anything that a person was trained on, but is not doing what the law requires according to legislation. SME03: Not following procedures or adhere to training in terms of safety procedures.
Accountability for wearing safety gear	SME02: The other category is pure wilful, intentional negligence. The person is working at night, he knows management is not there and he ignores the safety procedures and does not wear his safety gear. SME03: Look, he has a certain code he has to adhere to in terms of safety gear and uniform, like hard hats and boots with steel

	toes, uhmm.. There are a lot of things like harnesses above 1.5m.
Main question: How does a person's individual behaviour feature in safety?	
Accountability for adhering to safety regulations	SME01: Task behaviour can also be done either with compliance or non-compliance with the rules. Often, non-compliance is because of the supervisor's attitude toward safety checks; he wants to get the job done and he doesn't check anything. SME02: People walk past unsafe conditions and decide it's not my problem.
Accountability towards co-workers	SME01: And this works in the way that when risky tasks have to be completed, co-workers check each other to adhere to the safety behaviours required for the task. SME02: I think on average, if you look at all people working in industry, in my opinion 50% of them – unacceptable behaviour. And it's not just wearing protective gear, but the most important aspect is the obligation on everyone to report unsafe conditions and behaviour.
Accountability for wearing safety gear	SME02: And it's not just wearing protective gear.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Accountability towards co-workers	SME01: It might also be peer pressure, because it's your work mates and if you don't do it, they might treat you as an outcast or not want to share the bonus with you or it may hamper your working relationship with time. And if he doesn't want to work, the boss might ask why and

	then they will have to admit that they worked while there was a gas leak. So peer pressure has a lot of power when it comes to behaviour. But peer pressure can also work the other way around, in a good way, where a few guys want the money, but the rest refuse because they know it's too risky.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Accountability for adhering to safety regulations	S01: Yes, because employees do not implement the training that they received. Employees also show a lack of commitment and the feeling that the employer is always at fault. SME02: There is a perception that for any type of injury, they qualify for compensation, that is what they believe. There are people who willingly injure themselves to qualify for compensation, like the wearing of hearing protection – they don't wear it because, if you lose 20% of hearing, you qualify for compensation, but you can still talk and hear. So they wilfully engage in unsafe behaviour to obtain compensation.

Discussion

From the data gathered, it is evident the participants felt that workers' attitude and commitment to safety affect safety behaviour with regards to the following aspects:

- Safety seen as a hassle
- Wilful negligence for compensation
- Accountability for wearing safety gear

- Accountability for adhering to safety regulations
- Accountability towards co-workers

The participants indicated that workers' attitudes and commitment to safety can be linked to their sense of accountability for each other's safety and their own safety. One participant stated that some workers would actually injure themselves on purpose for compensation, due to the fact that they are more driven by the money than by safety or loyalty to each other.

The data confirmed the findings of the following authors regarding workers' attitudes and commitment towards safety:

- Dejoy (1990:110) linked worker perception of safety events to workplace safety in his study on attribution theory and workplace safety.
- Mohamed (2002:375) found that some workers struggled to understand safety training instructions and held a negative attitude towards safety procedures due to this, which results in a lack of adherence to safety measures and higher involvement in unsafe behaviour.
- Various studies have confirmed these findings (Ball *et al*., 2009:206; Canter & Donald, 1990:112; Choudhry *et al*., 2009:892; Choudhry & Fang, 2008:566; Cox & Cox, 1991:16; Donald & Young, 1996:15; Fang *et al*., 2006:573; Gillen *et al*., 2004:240; Mohamed, 2002:378; Mohamed *et al*., 2009:30; Mullen, 2004:280; Sawacha *et al*., 1999:310; Vinodkumar & Bhasi, 2009:664).
- Risk-taking behaviour, which leads to increase in exposure to risks and danger, stems from the workers' attitude toward safety (Fang, Chen & Wong 2006:575; Mohamed, 2002:376).

6.2.5 Subtheme 1.5: Workers' physical abilities

The main questions relating to workers' physical abilities and their answers, as well as the probing questions and resulting answers are displayed in Table 9.

Table 9: Questions and answers relating to workers' physical abilities

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Basic job requirements	SME01: Well, I believe that here you need a specific profile for a specific job. As I mentioned, a guy who works in scaffolding, should not have a fear of heights. Those are the basics and you should be able to check for that before the guys come in, because that's your best time.
Probing question: How do you identify unsafe behaviour?	
Senses Deficiencies Fatigue Concentration levels Judgement Memory Mechanical aptitude	SME01: The human factors such as physical capability, deficiencies like hearing or eyesight deficiency, for example a driver, has to be able to see, though not everyone does or a guy who works with machines and has to be able to hear if something sounds wrong in the machine, cannot have a hearing problem. Like the guy who drives into the pole, perhaps he can't see well, but why didn't you test him? It costs too much money, or the place we use closed. Physical condition, fatigue, by lack of rest and often, especially in construction, they make the people work incredible hours, especially people who work with machines and your concentration fades after a while. You can't work two sixteen hour shifts on a machine and dig enough holes and work cranes with heavy weights. Many of the accidents on the highways are caused by fatigued drivers, forced to work extreme hours with no rest between destinations.

	And then we have mental state, poor judgment, memory failure, mechanical aptitude, sometimes workers don't have the physical stimulation needed when they were young to develop mechanical abilities.
	S02: We try to determine if they have good balance, a fear of heights, good eyesight and hearing
Probing question used: How does behaviour feature in the risk assessment process?	
	SME03: ...as well as physical ability and ability to do the work, discipline and attention span plays a big role.

Discussion

From the data gathered, it is evident the participants felt that workers' physical abilities affect safety behaviour with regards to the following aspects:

- Senses
- Deficiencies
- Fatigue
- Concentration levels
- Judgement
- Memory
- Mechanical aptitude
- Basic job requirements

The data confirmed the findings of the following authors regarding worker physical abilities and the impact it has on safety behaviour:

- McGilley and Holmes (1988:129) investigated the relationship between aerobic fitness and stress tolerance. They determined that individuals with high fitness levels recovered quickly from stress and were able to cope more easily with stressful situations than individuals with low fitness levels.

- Stress has been linked with psychological illness and can affect the worker's mental state negatively (Norris, Carroll & Cochrane, 1990:373; Roth & Holmes, 1985:168).

6.2.6 Subtheme 1.6: Workers' culture

The probing questions which led to discussions regarding workers' culture and their answers are displayed in Table 10.

Table 10: Question and answer relating to workers' culture

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Adherence to rules	SME03: From a lower class labourer, he has to be willing to adhere to rules and culture can come in conflict with the rules. He has to be willing to comply with the rules and do as he is told.
Probing question: When you speak of cultural factors, which factors are the most influential in that regard?	
Cultural differences	SME03: There are a lot of different cultures amongst the workers. I don't like calling them by name, so let's say Culture A and Culture B clash. Now you have a leader in A and his followers are from B, so that's basically what I mean when I refer to culture clashes. We often have situations where the workers sleep at the site and problems arise there, because the guys create problems amongst each other after work. The cultures clash and they see it as an issue to follow someone from a different culture
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Cultural differences	S01: I think if you look at the majority of

	workers and you study or analyse the culture they come from, they are not used to wearing safety gear. We had one instance where a young black guy, hard worker, very committed, was not wearing his safety glasses.
Main question: How does a person's individual behaviour feature in safety?	
Cultural beliefs with regards to leadership	SME03: Within the workers, there are guys who have strong leadership skills and the guys tend to follow them, if there is a problem, he'll come and talk to you. So that guy's behaviour determines his co-workers' behaviour, this is also inherent to their culture. We try to make them the supervisors, because they already have the respect of their co-workers and they enable us to manage the whole group.

Discussion

From the data gathered, it is evident the participants felt that workers' physical abilities affect safety behaviour with regards to the following aspects:

- Cultural differences
- Adherence to rules
- Cultural beliefs with regards to leadership

Workers' specific cultural beliefs were discussed in terms of their impact on perceptions of masculinity and the subsequent relationship to worker safety behaviour. If a worker believes wearing safety gear will subtract from masculine status, it will most likely not be worn. This has serious implications for safety and should be taken into consideration when training workers to dispel misconceptions regarding masculinity and safety. Also, if a certain worker is perceived as a leader in the cultural group, his behaviour will determine

the behaviour of other workers, which has adverse implications for safety if the leader displays a negative attitude towards safety.

The data confirmed the findings of the following authors regarding workers' culture and the impact it has on safety behaviour:

- Culture has been investigated as an independent variable which impacts both safety attitudes and safety behaviour (Ajiferuke & Boddewyn, 1970:153; Enshassi & Burgess, 1990:97; Mohamed *et al*., 2009:30).
- Culture also influences a worker's own risk perception and attitudes towards safety (Cox & Flin, 1998:190).
- Language differences between workers themselves, workers and supervisors and supervisors and management impact on worker safety in terms of important information being lost in translation (Shapira & Lyachin, 2009:28).

6.2.7 Subtheme 1.7: Workers' education levels

The probing questions which led to discussions regarding workers' level of education and their answers are displayed in Table 11.

Table 11: Question and answer relating to workers' education levels

Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Communication problems	SME02: Maybe another aspect, so many people, who when subjected to a lie detector test, fail, because they are scared and stressed. If you take a low-level, low-skilled, uneducated, illiterate worker and the doctor or nurse start talking about psychological things, they don't understand what it's about. I had one person working for 25 years for one company. I asked him if it was explained to him why he must go for

	medicals and what would happen if he was affected by a chemical. He answered that it was not discussed with him. I then asked him what he would do if I told him that he had to go for a medical after lunch. He answered; I will go and I lock myself in the bathroom until closing time, because I am scared. What if I lose my job? You find that a lot.
Main question: Are there preventative measures in place to ensure workplace safety?	
Communication problems	SME03: We don't test the guys for phobias and things, as our recruitment process is informal; normally the supervisor recruits guys that he trusts and knows can do the job. The guys are low skilled, mostly illiterate and often times they are foreigners with valid work permits. You can't communicate with them. They don't understand English or Afrikaans. If you try to test for that, you'll probably draw a wrong conclusion in terms of that.

Discussion

From the data gathered, it is evident the participants felt that workers' level of education impact on their mental state and response to safety procedures and tests that are put in place to ensure that workers are psychologically fit for work.

The results support the views of the following authors with regard to the impact of lower levels of education on worker safety in construction:

- Siu *et al*. (2003:200) found that lower education levels negatively affect safety behaviour.

- Laukkanen (1999:60) and Rowlinson (2003:170) revealed a direct relationship between education levels and accident proneness.
- Garret and Teizer (2009:760) indicated that literacy plays a role in worker compliance with written policies and procedures.
- Various investigations into education levels of employees and its impact on their safety behaviour have confirmed the views of the interviewees (Iverson & Erwin, 1997:115; Price, 1977; Starren *et al.*, 2009:5; Zwetsloot *et al*., 2006:772).

6.2.8 Subtheme 1.8: Workers' safety awareness

The main and probing questions which led to discussions regarding workers' awareness of safety procedure and policies and their answers, are displayed in Table 12.

Table 12: Questions and answers relating to workers' safety awareness

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Lack of safety awareness	S03: I think the knowledge that they have about safety procedures and regulations is also important.
Main question: What would you classify as unsafe behaviour on a construction site and how would you identify it?	
Risk assessment factor	SME01: Lack of awareness, this is more related to the things you want to investigate, improper decision-making or lack of judgment, but for each of these things, there is a technique which they call the 'five why technique'.
Main question: How does a person's individual behaviour feature in safety?	
Risk assessment factor	SME01: Now the construction regulations require risk assessments. Severity, frequency and probability are taken into account. How bad could it be if something goes wrong? How much exposure is there

	to the risk? How often? What is the chance that it can happen? Do the workers know about the safety controls in place?
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Lack of understanding	S01: We had one instance where a young black guy, hard worker, very committed, was not wearing his safety glasses. One day the inspector did a site inspection. The supervisors asked him to talk to the young man to wear his glasses. He approached him respectfully and he asked him why he was not wearing his safety glasses. The man's answer was "But I can see properly". So his understanding was that the glasses were there to make him see well.
Lack of safety awareness	S03: It could also stem from a lack of knowledge or negligence. Often we find that a guy picks up a machine to work with and the safety gear is in the trunk on the ground, he just doesn't want to walk down to get it and works without it. Could be negligence or just pure laziness?
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Cause of accident	S01: Some employees make accidents because they lack knowledge and skills.
Risk assessment factor	SME04: In terms of measuring safety climate, important factors that play a role in the overall climate, are employee knowledge of safety regulations and legislation for the company, safety training for workers, worker actions on the job..

Probing question used: Are there preventative measures in to ensure workplace safety?	
Lack of safety awareness	SME01: Do the workers know about the safety controls in place? Based on this, you get a ranking, to determine which type of controls need to be in place.

Discussion

From the data gathered, it is evident the participants felt that workers' levels of awareness of safety procedures affect safety behaviour with regards to the following aspects:

- Lack of safety awareness
- Risk assessment factor
- Cause of accident
- Lack of understanding
- Lack of safety awareness

The participants felt that a lack of safety awareness, whether it is due to a lack of understanding or general awareness, generally leads to accidents and this aspect should be included as a risk assessment factor.

The results support the views of the following authors with regard to the impact of lower levels of education on worker safety in construction:

- The knowledge of safety procedures has been proven to be crucial for adherence to safety behaviour and workers need to be made aware of procedures (Butler & Jones, 1979:301; Choudhry & Fang, 2008:566; Dwyer & Raftery, 1991:170; Fang *et al.*, 2004:430; Garret & Teizer, 2009:750; Henning *et al.*, 2009:340; Khanzode *et al.*, 2012:1355; Koehn *et al.*, 1995:262; Nouri *et al.*, 2008:320; Shappell & Wiegmann, 2001:70; Siu *et al.*, 2003:200; Törner & Pousette, 2009:402; Vinodkumar & Bhasi, 2009:664; Wilson, 1989)

6.2.9 Subtheme 1.9: Workers' mental state

The probing questions which led to discussions regarding workers' mental state and their answers are displayed in Table 13.

Table 13: Questions and answers relating to workers' mental state

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Risk factors in workers	SME01: And then we have physical mental state, poor judgment, memory failure, and mechanical aptitude. Sometimes workers don't have the physical stimulation needed when they were young to develop mechanical abilities. Mental stress. SME03: If you think in terms of psychological factors, it will be paired with a rebellious act. S03: Often we find that a guy picks up a machine to work with and the safety gear is in the trunk on the ground, he just doesn't want to walk down to get it and works without it. SME04: I would say attitudes of workers and their mindset towards safety in terms of production versus safety.
Phobias and fears	SME02: The intent was not to test the worker psychologically, but to use a questionnaire to identify any fears of the worker and to determine if the worker wears safety gear and adheres to procedures.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Phobias and fears	SME01: Do they have any phobias and

	were they tested for it?
Phobias and fears	SME02: Some people might not reveal their psychological fears because they might not get the job.
Stress	SME02: Maybe another aspect; so many people, who when subjected to a lie detector test fail, because they are scared and stressed.
Uncertainty	SME02: If you take a low-level, low-skilled, uneducated, illiterate worker and the doctor or nurse starts talking about psychological things, they don't understand what it's about.
Main question: How does behaviour feature in the risk assessment process?	
Attention span	SME03: physical ability and ability to do the work, discipline and attention span plays a big role

Discussion

It was evident from the data gathered that mental states such as specific fears and phobias, stress tolerance, attention span and uncertainty impact on construction workers' responses to safety procedures which are put in place to ensure that workers are psychologically fit for work.

The results support the views of the following authors with regard to the impact of a worker's mental state on safety behaviour in construction:

- Brand-Labuschagne (2010:181) defined psychological fitness as "a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely". If a worker does not have a sound state of mind, psychological fitness would therefore be impaired.
- A phobia is defined as "an extreme or irrational fear of or aversion to something" (Oxforddictionaries.com, Not dated). In construction work, a fear of heights in tower

crane or scaffolding work or a fear of confined spaces as a mine worker would cause a worker's psychological fitness level to decline.

6.3 THEME 2: SUPERVISOR'S ROLE

It was interesting to note that only the SMEs identified factors relating to the supervisor's role. The supervisors did not volunteer any information regarding this aspect. This could be explained by the concept of self-serving biases, where the supervisors blame the workers for accidents, to absolve themselves from blame (Bradley, 1978:60). The researcher decided to include this theme in the findings, because the South African environment was investigated and, according to the South African SMEs and supervisors interviewed, one cannot separate the individual factors from the supervisor's role, as they are interdependent. Workers can sense whether their supervisors care about them and their safety and will respond accordingly in terms of safety behaviour. In addition to this, supervisors are a crucial link between the workers and management in the establishment of a positive safety climate (Shapira & Lyachin, 2009:29).

From the data gathered, it was evident that the participants believe that a supervisor's role in safety adherence impacts directly on workers' perceptions of safety and adherence to safety procedures, in terms of:

- caring behaviour displayed by the supervisor;
- visible accountability of supervisors in terms of safety;
- the overall safety culture created by the supervisor;
- pressure by supervisors for workers to engage in unsafe behaviour;
- the level of supervision required in terms of worker experience;
- supervisor's enforcement of safety procedures; and
- supervisor's identification of unsafe behaviour and the culprits.

The answers to the following main questions gave rise to theme 2:

- **Main question:** How does behaviour feature in the risk assessment process?
- **Main question:** How does a person's individual behaviour feature in safety?

- **Main question:** Are there preventative measures in place to ensure workplace safety?
- **Main question:** In the construction industry, whose behaviour contributes most to unsafe behaviour?
- **Main question:** Please can you name the specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?
- **Main question:** Are there other factors which you would consider problematic in terms of adherence to safety procedures?
- **Main question:** What would you classify as unsafe behaviour on a construction site and how would you identify it?

This theme unfolded in the following subthemes:

- Subtheme 2.1: Caring behaviour of supervisor
- Subtheme 2.2: Trust relationship between supervisor and workers
- Subtheme 2.3: Safety enforcement

6.3.1 Subtheme 2.1: Caring behaviour of supervisor

The main questions which led to a discussion regarding caring behaviour of the supervisor and its answers are displayed in Table 14.

Table 14: Question and answer relating to caring behaviour of supervisor

Main question: How does behaviour feature in the risk assessment process?	
Workers' perceptions of caring behaviour of supervisor	SME01: In order to determine why people do or do not do certain things, we look at factors like relationships. Is there caring behaviour from the supervisor? Often, supervisors do not care about workers and workers can see this. Are they valued for who they are and what they do? Does the supervisor care about their safety and adhere to safety controls? Does he do risk assessment beforehand and check that

	everything is ready? Or is he non-caring and does he just pressure them to get the job done in spite of the risk? This can lead to counter-controls, learned helplessness and even sabotage by the workers.
Main question: How does a person's individual behaviour feature in safety?	
Supervisor respects worker	S03: Someone who is respected, even if he is not a foreman or supervisor, will be followed. In terms of leadership in their cultures, acknowledgment and respect is important to them. We found that showing that to them, by acknowledging and respecting them, instead of trying a bombastic approach and forcing your leadership on them, if you do that, you are not respecting them and they will stab you in the back, because the find no joy or pride in their position, but if you take him and treat him as important, it makes a world of difference. It's a psychological way of working with them.

Discussion

From the data gathered, it is evident the participants felt that the caring behaviour of supervisors affect worker safety behaviour with regards to the following aspects:

- Workers' perceptions of caring behaviour of supervisor
- Supervisor respects worker

Specifically in terms of cultural differences and perceptions of respect, the participants felt that supervisors who respected their workers and cared about their safety were more effective in promoting safety adherence amongst workers than supervisors who did not care about their workers or their safety, but chose to focus on deadlines and production.

The results support the views of the following authors with regard to the impact of a worker's mental state on safety behaviour in construction:

- A study by Mearns and Reader (2008:391) determined that positive perceptions of management, supervisor and co-worker commitment to worker safety and well-being influence safety behaviours as part of a joint process, where workers are willing to 'reward' the organisation for its perceived investment in their personal well-being and vice versa.
- In a recent study, workers explained that they felt comfortable with supervisors who cared for their safety (Choudhry & Fang, 2008:575; Langford *et al*., 2000:133).

6.3.2 Subtheme 2.2: Trust relationship between supervisor and workers

The main questions which led to a discussion regarding the trust relationship between supervisor and workers and the answers are displayed in Table 15.

Table 15: Questions and answers relating to the trust relationship between supervisor and workers

Main question: Please can you name the specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Trustworthy	SME04: The worker also has to know that he can trust his supervisor.
Main question: How does behaviour feature in the risk assessment process?	
Visible accountability of supervisors in terms of safety	SME01: We get everyone from all levels involved and you explain all the risk assessment processes and procedures with them and get them to form an emotional contract with each other, by physically shaking each other's hands and committing to adhere to safety procedures and to be accountable to each other for this. And everyone sees this, so there is extra accountability. And every level does this

	with other levels and their own level.
Main question: Are there preventative measures in place to ensure workplace safety?	
Safety culture	SME02: I think what management, they just don't care, if people are treated fairly, receive a justifiable, reasonable salary. It's not just work, work, work... There is a culture outside health and safety that should be addressed. If your personal life is a mess, you cannot function. People must be treated fairly. Why is it that I've never seen people go on strike because the workplace is unsafe, but the moment they get an unfair salary, that's the quickest, they go on strike? I want people to down tools, go to management and tell them that it is unreasonable to work in the unsafe conditions. Safety can only be addressed if the culture in this country is corrected.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Visible accountability of supervisors in terms of safety	SME04: The image of supervisors and managers and their actions towards safety and their.. What's the word.. uhm.. the image they show towards safety. It influences the overall safety of the company
Main question: How does a person's individual behaviour feature in safety?	
Respect	S03: Someone who is respected, even if he is not a foreman or supervisor, will be followed. In terms of leadership in their cultures, acknowledgment and respect is important to them. We found that showing that to them, by acknowledging and respecting them, instead of trying a

	bombastic approach and forcing your leadership on them, if you do that, you are not respecting them and they will stab you in the back, because the find no joy or pride in their position, but if you take him and treat him as important, it makes a world of difference. It's a psychological way of working with them.

Discussion:

From the data gathered, it is evident the participants felt that the trust relationship between supervisor and workers affect worker safety behaviour with regards to the following aspects:

- Respect
- Visible accountability of supervisors in terms of safety
- Safety culture
- Trustworthy

The participants discussed the value of visible commitment to safety from supervisors, as well as the need for workers to be able to trust their supervisors, which reflect on the safety culture of the company as a whole.

The results support the views of the following authors with regard to the impact of the trust relationship between workers and their supervisors:

- Dejoy (1990:12) linked general supervisory response to safety events with workplace safety in his study on attribution theory and workplace safety. When supervisors showed interest and gave personal attention to workers, the workers felt that their safety was important to management, which led to higher safety behaviour among workers.
- In a recent study, workers explained that they felt comfortable with supervisors who cared for their safety (Choudhry & Fang, 2008:575; Langford *et al*., 2000:133).

- When the safety climate is negative, employees and managers blame each other for not adhering to workplace safety and this breaks down the trust relationship (Chang & Wang, 2010:61; Omogoroye & Oke, 2007:589).
- Larsson *et al*. (2008:411) determined that improving supervisors' behaviour towards safety could in turn improve worker safety behaviour, by building the trust relationship. Therefore, if workers know the supervisor cares about their safety, they will be more willing to trust in the supervisor.

6.3.4 Subtheme 2.3: Safety enforcement by supervisor

The main questions which led to a discussion regarding safety enforcement by the supervisor and answers are displayed in Table 16.

Table 16: Questions and answers relating to safety enforcement by supervisor

Main question: How does behaviour feature in the risk assessment process?	
Pressure to engage in unsafe behaviour	SME01: Often, supervisors do not care about workers and workers can see this. Are they valued for who they are and what they do? Does the supervisor care about their safety and adhere to safety controls? Does he do risk assessment beforehand and check that everything is ready? Or is he non-caring and does he just pressure them to get the job done in spite of the risk?
Level of supervision required	SME02: And the aspect of supervision is also not understood correctly. You get two types of supervision: direct and general. Direct supervision is supervisors appointed to supervise in a full-time capacity what the person is doing, newly trained people, and hazardous type of work. The more experienced and familiar people get with what they do, we go to general

	supervision … SME03: Because the guys are prone to rebellious behaviour, they feel someone just above them is not necessarily high enough above them to be respected.
Main question: Are there preventative measures in place to ensure workplace safety?	
Supervisor's enforcement of safety in terms of risk assessment	SME01: Now the construction regulations require risk assessments. Severity, frequency and probability are taken into account. Do the workers know about the safety controls in place? Do the supervisors enforce it?
Main question: What would you classify as unsafe behaviour on a construction site and how would you identify it?	
Identify unsafe behaviour offenders	S02: The supervisor has to maintain respect and if he comes to a manager to sort out problems, the guys are never going to respect him, so we give him the power to do so. He will advise the workers to wear the gear, but if someone continues to be a problem, management will have a discussion with the problem worker, which could lead to dismissal.
Main question: In the construction industry, whose behaviour contributes most to unsafe behaviour?	
Identify unsafe behaviour offenders	SME02: I would say the general answer to that question would be the construction worker. A more direct answer would be supervisors. Not because they are solely responsible, but if they did their job properly, they would identify people not adhering to safety procedures and complying with the rules.

Safety enforcement by supervisor	S02: The labourer has to be watched by the supervisors, so I think their behaviour is the most important.
Main question: How does a person's individual behaviour feature in safety?	
Safety enforcement by supervisor	SME03: The supervisors need knowledge on the factors in safety, he needs to be able to apply it and ensure that the guys under him also do so.

Discussion

From the data gathered, it is evident the participants felt that safety enforcement by the supervisor affects worker safety behaviour with regards to the following aspects:

- Safety enforcement by supervisor
- Identify unsafe behaviour offenders
- Supervisor's enforcement of safety in terms of risk assessment
- Level of supervision required
- Pressure to engage in unsafe behaviour

The participants stated that supervisors need to have extensive knowledge of safety regulations and procedures in the company and that they have to be able to enforce these aspects. They also indicated that supervisors need to identify offenders and be given the authority to deal with such cases in order to be respected by the workers. The participants also felt that supervisors need to adhere to these regulations themselves and not encourage unsafe behaviour for higher production rates.

The results support the views of the following authors with regard to the relationship between the supervisor's attitude towards the workers and his level of care for their safety:

Dejoy (1990:110) linked general supervisory response to safety events with workplace safety in his study on attribution theory and workplace safety.

- In a recent study, workers explained that they felt comfortable with supervisors who cared for their safety (Choudhry & Fang, 2008:575; Langford *et al*., 2000:133).

- Various studies have indicated the importance of supervisors' attitudes towards safety and the safety of their subordinates as a crucial role player in unsafe behaviour; typically indicated as a direct relationship between the supervisors' concern for worker safety and workers' commitment towards workplace safety (Choudhry & Fang, 2008:566; Gillen *et al*., 2004:251; Hayes *et al*., 1998:146; Iverson & Erwin, 1997:115; Langford *et al*., 2000:133; Omogoroye & Oke, 2007:589; Paap, 2003:198).
- Garret and Teizer (2009:760) explain that when a supervisor instructs employees to disregard safety behaviour, demonstrates shortcuts to safety and ignores insubordinate acts by workers such as not wearing safety gear, it increases unsafe behaviour. Also, negligence in terms of avoiding identification and resolutions of problems and reporting faulty equipment results in increased risk for accidents.
- Shapira and Lyachin (2009:29) determined that supervisors need to be able to act in an authoritative manner, to be accountable for their own and the workers' adherence to safety regulations, and they need to be sensible and alert in high risk situations in order to help prevent serious injuries or damage on site.

6.4 THEME 3: EXTERNAL FACTORS

External factors relate to factors outside the individual and they are not part of the supervisor's role. All the SMEs and one of the supervisors emphasised the fact that the external environment and factors play a significant role in terms of safety practices and adherence by construction workers. The factors identified include pressure to perform due to time constraints and budget implications, with management rewarding unsafe behaviour and punishing adherence to safety regulations by victimising workers who refuse to do unsafe work.

The answers to the following main and probing questions gave rise to theme 3:

- **Main question:** How do you identify unsafe behaviour?
- **Main question:** Which other factors would you consider problematic in terms of adherence to safety procedures?
- **Main question:** How does behaviour feature in this process?

- **Main question:** Are there other factors which you would consider problematic in terms of adherence to safety procedures?
- **Main question:** In the construction industry, whose behaviour contributes most to unsafe behaviour?
- **Main question:** Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?
- **Main question:** How do you in the industry identify the root causes of accidents?
- **Probing question:** In other words; which factors could cause them to engage in unsafe behaviour on the construction site?

This theme unfolded in the following subthemes:

- Subtheme 3.1: Pressure to perform
- Subtheme 3.2: Management's safety commitment
- Subtheme 3.3: Rewarding unsafe behaviour
- Subtheme 3.4: Lack of proper equipment
- Subtheme 3.5: Peer pressure

6.4.1 Subtheme 3.1: Production focus instead of safety focus

The main questions relating to production focus instead of safety focus and answers are displayed in Table 17.

Table 17: Questions and answers relating to production focus instead of safety focus

Main question: How do you identify unsafe behaviour?	
Pressure to finish on time	SME01: There is pressure to finish the job on time. In various situations, the supervisors know something is wrong, but they reward the guys because it gets the job done faster.
Main question: How does behaviour feature in this process?	
Monetary rewards	SME01: Often times management changes and one guy thinks it's silly; they are

	wasting time. So someone has to reinforce it. Workers have to see the commitment and they need visible felt leadership and this is where caring behaviour comes in again. But unfortunately, in the real world, this is not what happens, due to the pressure and hunger for money.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Monetary rewards	S02: If he is threatened in terms of monetary rewards, he will forget about safety and just finish the work S03: Pressure to meet deadlines can also play a role, it usually stems from the supervisor or foreman, and it's not inherent in the worker, as he works towards his daily allowance, not the deadline.

Discussion

From the data gathered, it is evident the participants felt that a production focus instead of safety focus affects worker safety behaviour in the form of the following aspects:

- Pressure to finish on time
- Monetary rewards

The participants felt that a production focus, which would indicate a focus on deadlines and output, instead of a focus on adherence to safety measures, put workers in a very difficult place, especially in terms of money earned and job security. The majority of the participants indicated that the South African construction industry is generally more production focused than safety focused.

The data supports the findings of the following authors with regard to production focus instead of safety focus and its subsequent impact on workers' adherence to safety procedures:

- Mullen (2004:278) determined that coercive pressure from management and supervisors to finish a job led to unsafe behaviour in construction workers.
- These findings are consistent with those by Mearns, Flin, Gordon and Fleming (2001:150) who found that, in a sample of offshore oil workers, unsafe behaviour was primarily predicted by production pressure.
- Choudhry and Fang (2008:576) determined that time constraints have a major impact on adherence to safety behaviour.
- The attitude of management regarding safety versus production weighs heavily on the type of pressure placed on workers, and the preference for safety needs to be communicated to workers by management (Flin, Mearns, O'Connor & Bryden, 2000:178; Mohamed, 2002:378).

6.4.2 Subtheme 3.2: Management's safety commitment

The main questions relating to pressure to perform and answers are displayed in Table 18.

Table 18: Questions and answers relating to management's safety commitment

Main question: How does behaviour feature in this process?	
Visible commitment	SME01: We get everyone from all levels involved and you explain all the risk assessment processes and procedures with them and get them to form an emotional contract with each other, by physically shaking each other's hands and committing to adhere to safety procedures and to be accountable to each other for this. And everyone sees this, so there is extra accountability and every level does this with other levels and their own level.

Main question: In the construction industry, whose behaviour contributes most to unsafe behaviour?	
Shifting responsibility	SME02: I would say the general answer to that question would be the construction worker. I personally blame the management. In general, management in this country are not involved the way they should be. They rely too much on safety officers and supervisors.
Main question: Please can you name specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?	
Safety culture determined by management	SME02: I think what management, they just don't care, if people are treated fairly, receive a justifiable, reasonable salary; it's not just work, work, work. There is a culture outside health and safety that should be addressed. If your personal life is a mess, you cannot function. People must be treated fairly. Why is it that I've never seen people go on strike because the workplace is unsafe, but the moment they get an unfair salary, that's the quickest, they go on strike? I want people to down tools, go to management and tell them that it is unreasonable to work in the unsafe conditions. Safety can only be addressed if the culture in this country is corrected. SME04: Managers' attitudes towards safety play a big part in a worker's commitment to safety. The worker also has to know that he can trust his supervisor.
Main question: How does a person's individual behaviour feature in safety?	
Visible commitment	S03: We also wear our own hard hats,

	because it shows them that it is for safety. We are committed to safety from top management downwards and we will even confront each other on wearing of safety gear.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Safe work environment	SME03: The employer has to create a safe environment for the worker and make it possible for the worker to work in safe environment. SME04: The image of supervisors and managers and their actions towards safety and their.. What's the word.. uhm.. the image they show towards safety.
Liability	SME03: On any contract a client is responsible for safety. He can move it to the contractor, but if something happens and there is a court case, the client is held responsible. Thus the need for the safety officer, and generally, we adhere to his stipulations and recommendations, because he can shut us down. It is a good system.
Elements of safety climate or culture	SME04: In terms of measuring safety climate, important factors that play a role in the overall climate, are employee knowledge of safety regulations and legislation for the company, safety training for workers, worker actions on the job, where a supervisor would perform a job analysis, safety aspects in the job description, safety mentioned in a company's vision and mission. If you look at

	a company as a whole, you could determine the maturity of the safety culture if they have all these aspects in their company.
Main question: In the construction industry, whose behaviour contributes the most to unsafe behaviour?	
Liability	SME03: It is our responsibility as employer to ensure that the supervisors know that it is their responsibility. Communication in that regard is very important. We are responsible for everything. It is an interdependent process.

Discussion

From the data gathered, it is evident the participants felt that management's safety commitment affects worker safety behaviour in the form of the following aspects:

- Liability
- Elements of safety climate or culture
- Safe work environment
- Visible commitment
- Safety culture determined by management
- Shifting responsibility
- Visible commitment

The participants generally felt that management's commitment to safety has a tremendous impact on workers' safety perception and attitudes. They indicated that liability in terms of the legislation added to the effect of blame shifting for safety controls. They also felt that management needed to make their safety commitment visible to workers and that management is responsible for the safety culture. One participant identified elements that could be measured to determine a company's safety culture. This included employee knowledge of safety regulations and legislation for the company, safety training for workers, worker actions on the job, safety aspects in the job description and whether safety is mentioned in a company's vision and mission.

This data is in line with the following authors' findings regarding the impact of reward systems on safety behaviour and supports the authors' findings regarding management's commitment to safety and the impact on workers' safety commitment:

- Garret and Teizer (2009:761) emphasised the fact that management's commitment to safety has a direct impact on workers' safety commitment, adding that the safety culture is created by management and sustained by employees if both parties are equally committed.
- Langford *et al*. (2000:138) determined that supervisors and site managers should be visibly committed to safety procedures and display this commitment to workers, so that they understand the importance of safety and the fact that unsafe behaviour will not be tolerated.
- Management's commitment to safety has been shown to have a considerable impact on the safety commitment of workers and supervisors alike. Management is also responsible for ensuring that proper equipment is available and safe to use. All these aspects play on the trust relationship between workers and their employers, which in turn impacts on safety behaviour (Brown & Holmes, 1986:460; DeDobbeleer & Beland, 1991:100; Dejoy, 1994:4; Fogarty & Shaw, 2010:1455; Keren *et al*., 2009:1312; McDonald *et al*., 2009:53; Murphy *et al*., 1993:52; Seo *et al*., 2004:427; Vinodkumar & Bhasi, 2009:664; Zohar, 1980:96).
- Shapira and Lyachin (2009:29) determined that management's commitment to safety needs to be visible to the workers, because it has a strong impact on workers' conduct and adherence to safety regulations.

6.4.3 Subtheme 3.3: Rewarding unsafe behaviour

The main questions relating to the rewarding of unsafe behaviour and answers are displayed in Table 19.

Table 19: Questions and answers relating to management rewarding unsafe behaviour

Main question: Please can you identify the psychological factors that may lead to unsafe

behaviour?	
Production focus instead of safety focus	SME04: ..mindset towards safety in terms of production versus safety - I think in the South African industry the production mindset is prevailing
Main question: How do you identify unsafe behaviour?	
Time saving	SME01: In various situations, the supervisors know something is wrong, but they reward the guys because it gets the job done faster. Like safety checks on an electronic panel, where the electrician knows it will take him half an hour to perform all the checks and lock up the board with the locks, but he knows he's qualified; he just shouldn't touch that wire there, so he does the job in five minutes without switching off the current and then he accidentally touches a wire and shocks. And the thing with this is, once they've performed the shortcut and nothing happened, they repeat the unsafe behaviour and sometimes they show others how to perform the shortcut. And then the regulation gets bypassed, because the reward or consequence was positive. So if a worker does an at-risk behaviour and the result is positive, he will do it again.
Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Production focus instead of safety focus	SME01: Same thing in the mines, where the guys get paid, they get a production bonus on the core which they take out. So if they take out the rift as small as possible, you

	get a bonus, because you did not take out too many tons for a small amount of gold. There was a big accident at XXX mine, where there was a butane gas explosion, where, at the end of the month they had not reached their quota, and they would get the bonus only if this quota was reached. So they knew they should stop, because the gas was so dangerous, but they wanted the bonus. 65 guys died that day.
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Production focus instead of safety focus	S02: If he is threatened in terms of monetary rewards, he will forget about safety and just finish the work

Discussion

From the data gathered, it is evident the participants felt that management rewarding unsafe behaviour affects worker safety behaviour due to the following aspects:

- Time saving
- Production focus instead of safety focus

The participants indicated that deadlines and production rates were the main reasons why companies would reward unsafe behaviour and this relates to their general outlook, whether they have a production or a safety focus.

This data is in line with the following authors' findings regarding the impact of reward systems on safety behaviour:

- Ayers and Kleiner (2000:21) suggested a behaviour-based safety system, where desirable behaviour should be rewarded to maximise safety awareness, as this increases cooperation as opposed to when unsafe acts are punished. In line with

the factor identified in this subtheme, rewarding unsafe behaviour would therefore encourage such behaviour to continue.

- Langford *et al*. (2000:138) determined that monetary rewards for productivity lead to increased risk taking due to the need for an increased completion pace, which in turn compromises safety.

6.4.4 Subtheme 3.4: Lack of proper equipment

The main question and probing question relating to the lack of proper equipment and answers are displayed in Table 20.

Table 20: Questions and answers relating to the lack of proper equipment

Main question: How do you in the industry identify the root causes of accidents?	
Lack of equipment required to complete job	SME01: Wrong equipment, the guy has the wrong spanner, should have a shifting spanner. Sometimes he doesn't have the right tools, so he uses a makeshift tool, although, as a qualified mechanic, he knows it's wrong, but the airplane has to go up and people are complaining because they want to go home, so he makes do with what he has to save time. And what he really wants to do is to say, listen, this thing is broken and I do not have the right part, we can't use the plane.
Probing question: In other words; which factors could cause them to engage in unsafe behaviour on the construction site?	
Lack of equipment required to complete job	S02: Sometimes employees do not have the correct tools or equipment for the specific activity that they have to do

Discussion

From the data gathered, it is evident the participants felt that the lack of proper equipment affects worker safety behaviour when the equipment is required to complete the job safely and effectively. One participant also indicated that in terms of risk management, this aspect is often found to be the main cause of an accident.

This data is in line with the following authors' findings regarding the importance of access to proper equipment for adherence to safety procedures and processes:

- Garret and Teizer (2009:759) emphasise the importance of access to proper equipment to ensure that safety standards are upheld; stating that often damage to human assets and materials can be prevented by ensuring that the proper equipment is available.
- Langford *et al*. (2000:138) stated that correct equipment and proper use of equipment is crucial to improve safety performance.

6.4.5 Subtheme 3.5: Peer pressure

The main questions relating to peer pressure and answers are displayed in Table 21.

Table 21: Questions and answers relating to peer pressure

Main question: Please can you identify the psychological factors that may lead to unsafe behaviour?	
Negative impact	SME01: It might also be peer pressure, because it's your work mates and if you don't do it, they might treat you as an outcast or not want to share the bonus with you or it may hamper your working relationship with time.
Positive impact	SME01: But peer pressure can also work the other way around, in a good way, where a few guys want the money, but the rest refuse because they know it's too risky.
Main question: Please can you name specific psychological factors which could cause	

construction workers to be more willing to engage in unsafe behaviour?	
Negative impact	SME02: Or they believe they would be victimised if they refuse to do unsafe work SME03: If you think in terms of psychological factors, it will be paired with a rebellious act. It is quite common, where they start illegal strikes and force other guys to stop working. So the leadership factor can also be negative if that leader decides to take negative action
Main question: Are there other factors which you would consider problematic in terms of adherence to safety procedures?	
Positive impact	S02: If the workers supported each other to do their work more safely and taking responsibility for your own safety as well as that of others.

Discussion

From the data gathered, it is evident the participants felt that peer pressure affects worker safety behaviour positively or negatively, depending on the group consensus regarding safety and the strength of character of the worker. Autonomy and contribution to decisions by workers were also identified as a possible solution to these safety issues.

This data is in line with the following authors' findings regarding the impact of peer pressure on worker adherence to safety procedures and processes:

- Keren *et al*. (2009:1319) determined that peer pressure plays a significant role regarding decision-making in safety behaviour.
- Peer pressure is related to perceptions of co-workers' commitment and attitudes towards safety which has been shown to strongly influence workers' own commitment to safety (Ball *et al*., 2009:205; Burnkrant & Cousineau, 1975:206; Cavazza & Serpe, 2009:278; Chang & Wang, 2010:55; Choudhry & Fang,

2008:566; Choudhry *et al*., 2009:892; Clarke & Ward, 2006:; Dejoy *et al*., 2004:83; Gillen *et al*., 2004:81; Janis, 1983; Jiang *et al*., 2010:1468; Langford *et al*., 2000:134; Lapinski & Rimal, 2005:130; Larsson *et al*., 2008:410; Morrow *et al*., 2010:1461; Mullen 2004:280; Omogoroye & Oke, 2007:590; Starren *et al*., 2009:8; Subramaniam, 2004:112; Zohar, 1980:96).

6.5 THE THEORETICAL FRAMEWORK OF INDIVIDUAL FACTORS

The aim of this study was to develop a theoretical framework of individual factors which might cause construction workers to engage in unsafe behaviour at work. This section depicts the theoretical framework which was conceptualised from the literature review and the interview findings.

The framework can be seen as Figure 3 in this study. In the interest of comprehensiveness, all factors mentioned in the interviews and identified in the literature are included in the framework within their applicable categories. The categories are described in section 3.4 of this study. The factors regarding the supervisor's role was worked into the framework in terms of the impact of these factors on the different categories of individual factors and these factors are indicated in italics, whereas the external factors were added as an external category, because it affects the various identified categories in different ways. The factors regarding the supervisor's role and the external factors were added in the interest of considering the South African context, as they were identified by South African SMEs and supervisors. The factors were not included in to the literature review, which consists of mostly international research, as South African research on this topic is very limited and the aim of the study was to focus on individual factors in the construction workers themselves.

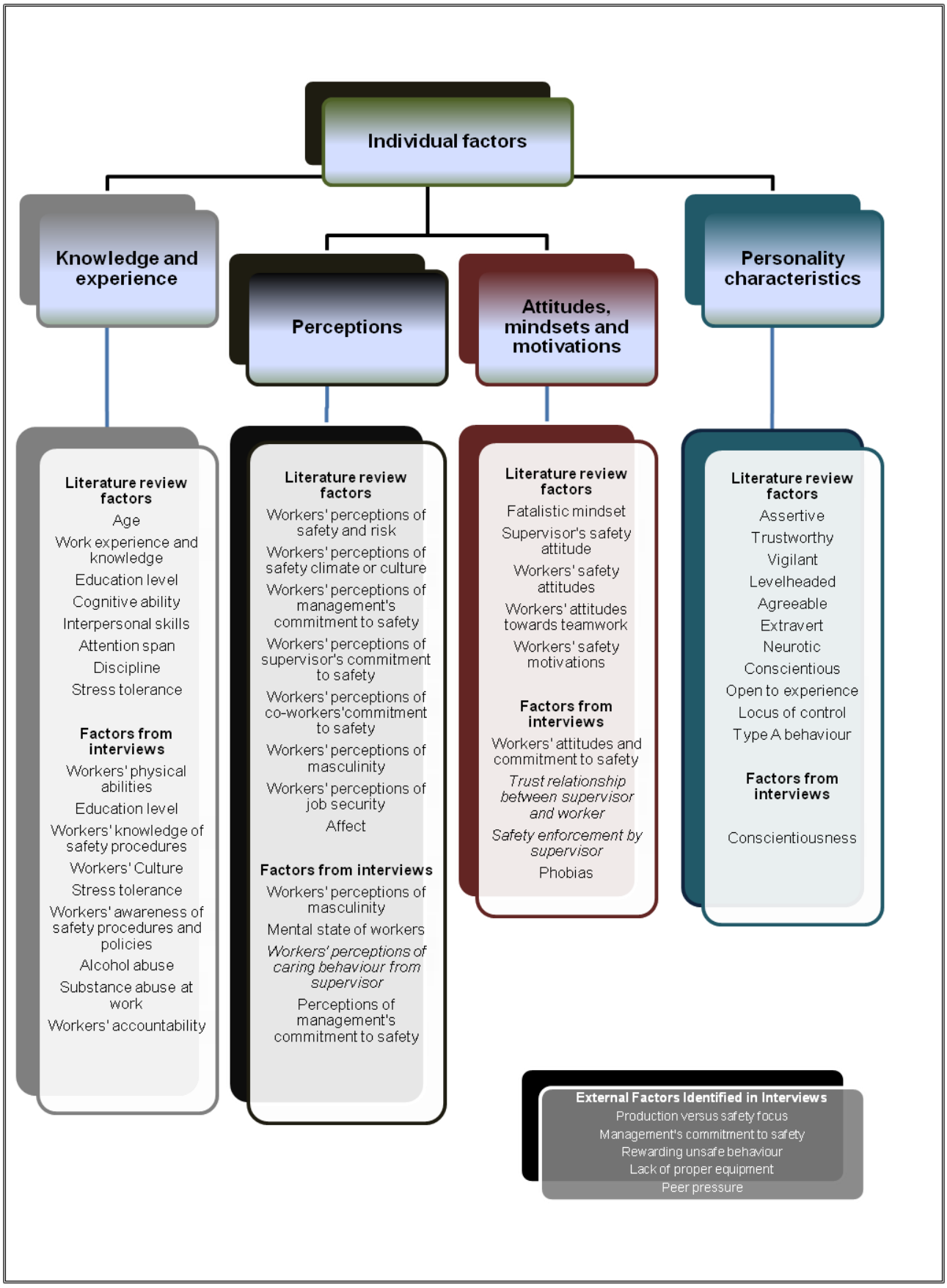

Figure 3: Theoretical framework of individual factors

6.6 CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

The concerning high occurrence of construction accidents is experienced worldwide and the cost implications are far-reaching. South African construction is not exempted from this issue and, in terms of South African legislation, both physical and psychological fitness are required to manage worker safety behaviour in construction. Psychological fitness has been defined as “a state in which an employee displays high levels of emotional and mental energy and high levels of psychological motivation to be able to work and act safely” (Brand-Labuschagne, 2010:181). Factors which impact on these levels and human error relating to safety behaviour in construction were investigated in the current study. Important aspects of any human error investigation are the factors in the individuals themselves. The study proposed to synthesise a framework for the specific individual factors which could influence a worker’s sound state of mind by using a synthesis of relevant literature and by interviewing SMEs and supervisors of construction workers and has achieved this.

The individual factors identified were grouped into four categories, namely knowledge and experience factors, perceptions and mindsets, attitudes and motivations and, lastly, personality characteristics. Each factor was investigated and conceptualised in terms of its impact on the safety behaviour of workers. The analysis of data from the interview presented three main themes, namely individual factors, which pertain to the workers themselves, factors related to the supervisor and, finally, external factors. In the interest of comprehensiveness, all the factors were included in the framework within the different categories, highlighting the factors related to the interviews and the literature review individually.

Recommendations for future research, when looking at the literature review and responses from the interviews, would relate to investigations into the actual levels of psychological fitness of South African construction workers and the impact of the tool developed to measure this (Brand-Labuschagne, 2010:180). Investigations into the personality factors, which affect the worker’s safety behaviour, could also be a possible gap in the body of research which could be very meaningful to the field. The body of research regarding the South African construction industry is limited and research into this area could be of great

value to future academic investigations specifically in terms of psychological aspects of workers and the working environment itself.

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APPENDIX A: Letter of consent

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Economic and
Management Sciences

Informed consent for participation in an academic research study

Dept. of Human Resources Management

THE INDIVIDUAL FACTORS WHICH CAUSE CONSTRUCTION WORKERS TO ENGAGE IN UNSAFE BEHAVIOUR: AN EXPLORATIVE STUDY TOWARDS THE DEVELOPMENT OF A MODEL

Research conducted by:

Mrs L.A. Louw (24120902)
Cell: 071 896 3999

Dear Respondent

You are invited to participate in an academic research study conducted by Larisa Alet Louw, a Masters student from the Department of Human Resources Management at the University of Pretoria.

The purpose of the study is to develop a model or framework of individual factors applicable to the South African construction industry to aid managers in complying with the new legislation by determining whether a worker is psychologically fit for the job.

Please note the following:

- This study involves an anonymous interview. Your name will not appear in the findings and the answers you give will be treated as strictly confidential. You cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- Please answer the questions as completely and honestly as possible. This should not take more than one hour of your time.
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my supervisor, Prof P Schaap, pieter.schaap@up.ac.za, if you have any questions or comments regarding the study.

Please sign the form to indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis.

Respondent's signature **Date**

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YUNIBESITHI YA PRETORIA
Faculty of Economic and
Management Sciences

Cover Letter: Aim of the study

South African construction companies have to adhere to the Occupational Health and Safety Act Section 15 (12) (a) which states that "A contractor shall ensure that all employees required to work or to be supported on a suspended platform are physically and psychologically fit to work safely in such an environment by being in possession of a medical certificate of fitness".

The purpose of including psychological fitness in this act was for the regulation of a potentially dangerous industry and for the creation of a legal structure to regulate the level of health and safety for this industry (Deacon and Kew, 2006).

Considerable research exists on causes of construction accidents and safety measures required, but there is limited focus on the workers themselves and the possible risk factors that they could display. In keeping with the legislation regarding construction workers, recruitment and selection could be aided by the identification of these individual risk factors in potential workers.

The aim of this project is;

- To develop a model or framework of individual risk factors in construction workers based on a review and synthesis of the academic literature available on this topic.
- To interview South African SMEs and supervisors of construction workers regarding individual risk factors based on their own extensive knowledge of the topic.
- To compare the framework with SME and supervisor opinions in order to synthesise a reliable, applicable model for identifying individual risk factors in South African construction workers.

To guide me in this study, please answer the five questions that follow in as much detail as possible.

Thank you for your time.

APPENDIX B: Interview schedule

(All the main questions or a number of the questions were asked depending on the factors identified by the participants and the issues addressed. Probing questions are indicated in Chapter 4, Section 4.6.)

Interview

1. Please can you identify the psychological factors that may lead to unsafe behaviour?

2. What would you classify as unsafe behaviour on a construction site and how would you identify it?

3. How does a person's individual behaviour feature in safety?

4. Please can you name the specific psychological factors which could cause construction workers to be more willing to engage in unsafe behaviour?

5. Are there other factors which you would consider problematic in terms of adherence to safety procedures?

6. How do you in the industry identify the root causes of accidents?

7. How does behaviour feature in the risk assessment process?

8. Are there preventative measures in place to ensure workplace safety?

9. In the construction industry, whose behaviour contributes the most to unsafe behaviour?

APPENDIX C: ATLAS.ti Outputs: Codes, families and memos

Codes identified

Accountability towards co-workers
Attention span of worker
Caring behaviour from supervisor
Cause external factors from environment
Cause of accident alcohol abuse
Co-worker commitment to safety
Comply with supervisor instructions
Discipline
Education
Employer rewards unsafe behaviour
Employer takes responsibility on behalf of worker
Horseplay by workers
Job pressure to finish on time
Lack of communication between levels
Lack of equipment - employer is at fault
Leadership style of supervisor
Learned helplessness due to supervisor's uncaring behaviour
Liability
Macho attitude
Management's commitment to safety
Mental state of worker
Monetary rewards linked to unsafe behaviour
Negative attitude towards safety
Negligence due to experience
Peer pressure - negative impact
Peer pressure - positive impact
Perceived job security
Physical abilities
Positive attitude towards co-workers
Production focus versus Safety focus
Rebellion by worker

Sabotage due to supervisor's uncaring behaviour
Safe working environment
Substance abuse
Supervisor's caring behaviour
Supervisor does not enforce safe behaviour
Teamwork
Training for safety
Trust between supervisor and worker
Trust relationship between employer and worker
Wilful negligence for compensation
Worker's culture
Worker's stress tolerance
Worker accountability for own actions
Worker compliance or non-compliance to rules
Worker concentration levels
Worker does not wear protective gear
Worker feels employer is at fault
Worker finds safety procedures a hassle
Worker lacks awareness of safety procedures
Worker lacks commitment to safety
Worker lacks skills and knowledge
Worker laziness
Workers do not apply training

Code Families

Code Family: External factors
Created: 12/04/20 01:32:19 PM (Louw)
Codes (23): [Cause external factors from environment] [Co-worker commitment to safety] [Employer rewards unsafe behaviour] [Employer takes responsibility on behalf of worker] [Job pressure to finish on time] [Lack of communication between levels] [Lack of equipment - employer is at fault] [Liability] [Management's commitment to safety]

[Monetary rewards linked to unsafe behaviour] [Peer pressure - negative impact] [Peer pressure - positive impact] [Perceived job security] [Production focus versus Safety focus] [Safe working environment] [Teamwork] [Training for safety] [Trust relationship between employer and worker] [Wilful negligence for compensation] [Worker's culture] [Worker feels employer is at fault] [Worker lacks awareness of safety procedures] [Worker lacks skills and knowledge]
Quotation(s): 59

Code Family: Individual factors of construction workers
Created: 12/04/20 01:31:45 PM (Louw)
Codes (36): [Accountability towards co-workers] [Attention span of worker] [Cause of accident alcohol abuse] [Co-worker commitment to safety] [Comply with supervisor instructions] [Discipline] [Education] [Horseplay by workers] [Learned helplessness due to supervisor's uncaring behaviour] [Macho attitude] [Mental state of worker] [Negative attitude towards safety] [Negligence due to experience] [Peer pressure - negative impact] [Peer pressure - positive impact] [Physical abilities] [Rebellion by worker] [Sabotage due to supervisor's uncaring behaviour] [Substance abuse] [Teamwork] [Trust between supervisor and worker] [Trust relationship between employer and worker] [Wilful negligence for compensation] [Worker's culture] [Worker's stress tolerance] [Worker accountability for own actions] [Worker compliance or non-compliance to rules] [Worker concentration levels] [Worker does not wear protective gear] [Worker feels employer is at fault] [Worker finds safety procedures a hassle] [Worker lacks awareness of safety procedures] [Worker lacks commitment to safety] [Worker lacks skills and knowledge] [Worker laziness] [Workers do not apply training]
Quotation(s): 84

Code Family: Role of supervisor
Created: 12/04/20 01:32:10 PM (Louw)
Codes (16): [Caring behaviour from supervisor] [Job pressure to finish on time] [Lack of communication between levels] [Leadership style of supervisor] [Learned helplessness due to supervisor's uncaring behaviour] [Monetary rewards linked to unsafe behaviour]

[Negative attitude towards safety] [Production focus versus Safety focus] [Sabotage due to supervisor's uncaring behaviour] [Supervisor's caring behaviour] [Supervisor does not enforce safe behaviour] [Trust between supervisor and worker] [Trust relationship between employer and worker] [Wilful negligence for compensation] [Worker does not wear protective gear] [Worker lacks commitment to safety]
Quotation(s): 48

REFLECTION

MEMO: First interview Reflection (Louw, 11/09/27 12:25:52 PM)

Interview 01 - I was a bit hesitant at the start, but after the first 20 minutes. I struggled to gain the information required from the SME. The conversation kept on returning to risk assessment - which is the SME's job role. I felt like my assumption was wrong - that the SMEs could not, in fact identify the individual factors.

MEMO: Interview with supervisor 01 (Louw, 11/10/01 02:53:44 PM)

The researcher noted that the supervisor did not acknowledge or offer any factors regarding his role in terms of the safety process. The researcher had to guard against interpreting this as blame shifting, due to prior research in the systematic literature review indicating that this was often the case. During the second interview, I developed a more guided approach, keeping the interviewee focused and asking questions to clarify answers. I also ensured that my questions focused on the factors I required and I tried to steer the interviewee in that direction. This interview was much shorter, but I felt that I got more detailed, relevant information due to the more guided questions

MEMO: Redraft of interview questions (Louw, 11/10/15 04:44:25 PM)

After the first two interviews, it was decided that the interview questions should be redrafted to include some of the probing questions used as main questions. This enabled me to obtain more detailed data in line with the research aims.

MEMO: Peer review (Louw, 12/07/03 02:51:25 PM)

Throughout the process, colleagues who are knowledgeable on health and safety matters were asked to review the coding process and make adjustments where necessary to ensure that the researcher remained objective and on par with the purpose of the study and aligned with the ethical and research design requirements of the study.

MEMO: Informed consent (Louw, 12/07/03 02:56:44 PM)

All participants signed an informed consent form, which contained a cover letter informing them of the purpose and objectives of the study. They were also made aware of their rights regarding the process.

MEMO: Data saturation (Louw, 12/07/28 01:20:05 PM)

Data saturation was achieved after four interviews, but three more interviews were done to ensure that the data was comprehensive. The participants were from different areas in construction, as well as mining, nuclear design and risk management, to ensure comprehensive coverage of the type of worker who normally does construction work (low education and literacy levels, labour intensive work).

MEMO: Ethical considerations (Louw, 12/07/28 02:40:55 PM)

The data made available on the CD was done is a way that ensures that the privacy and anonymity of the participants would be ensured. This study adheres to ethical considerations as described in chapter 5 of this study and these principles were adhered to throughout each step of the process. Sensitive data regarding specific companies mentioned in the interviews were omitted.