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Impact of Work Pressure on Construction Safety

Fidelis Emuze
Professor and Head, Department of Built Environment, Central University of Technology, Free State, Private Bag X20539, Bloemfontein, 9300, South Africa, Email: femuze@cut.ac.za

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Abstract: Uncontrolled increase in construction activities heightens work pressure, making a work site less safe due to deviations from safety working procedures. The unabated reporting of accidents in construction necessitates a study into work pressure and the threat to safe working procedures in construction. Thus, this study investigated how work pressure drives a decline in adherence to safe working procedures on-site, making it less safe. The data were collected from a closed-ended survey of construction professionals in a South African province. The Statistical Package for Social Sciences (SPSS) was used to analyse the collected data descriptively. The findings showed that work pressure from supervisors could lead to a decline in adherence to safe working procedures. If work pressure is unchecked, the outcome might result in safety violations on construction sites. The effects of work pressure on construction workers include problematic behaviour, stress, and fatigue. Other effects are interpersonal conflict, lack of concentration on work, and demotivation. This study was limited to examining how work pressure drives a decline in adherence to safe working procedures in construction. South Africa, as the site for data collection, is used for illustration purposes. In future studies, mixed-methods research in multiple contexts should be considered to produce insights transferable to other places. This article draws attention to practices that could make a construction site less safe through work pressures, especially in developing countries. It is argued conceptually that work pressure must be controlled to ensure that safe working procedures are not violated. Based on the findings, it was established that work pressure could accelerate a decline in adherence to safe working procedures, resulting in safety violations that create an environment in which accidents occur.

Keywords: Construction, safety violations, safe working procedures, work pressure.

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1. Introduction

Rasmussen (1997) observed that work in complex (socio-technical) systems is bounded by economic, workload and safety constraints. When a system goes beyond the economic boundary, it cannot be sustained financially. When a system goes beyond the workload boundary, people (and technology) cannot perform tasks as expected. When a system exceeds the safety boundary, it will fail functionally. According to this concept of boundaries, which has been cited widely (Carrillo, 2013; Dekker, 2011; Marsden, 2018), the operation of a critical safety system, such as that on a construction site, is surrounded on three sides (Dekker, 2011). Therefore, uncontrolled construction sites are unfriendly work environments, which expose workers to hazards, risks and accidents (Tunji-Olayeni et al., 2018; Ebekozien, 2021). Such work situations convert hazards into health and safety (H&S) risks. To mitigate hazards that are a threat to people in construction (PiC), Kim et al. (2019) suggested that contractors should develop safety management systems (SMS) and integrate them into safe work procedures (SWPs). The severity of injuries on construction sites and unabated fatalities reported in the media call for diligence in investigating various forms of causality (Hoyland et al., 2018).

Construction activities can increase work pressure, resulting in accidents (Han et al., 2014; Jaafar et al., 2018). Jaafar et al. (2018) identified work pressure as a source of H&S violations that must be addressed in construction. The pressure on worksites decreases adherence to SWPs, especially on construction sites. However, in the literature about H&S, less attention appears to be focused on how to guard against this, even when work pressure reportedly requires workers to increase output at the expense of SWPs. In addition to the above, this study was motivated by the prevalence of construction hazards on sites and the lack of consensus among scholars regarding the influence of work pressure on on-site operatives. Thus, the study reported in this article was focused on how work pressure drives a decline in adherence to SWPs and its corresponding impact on H&S performance on site. The paper has been structured into five sections, starting with the introduction. In Section 2, an overview of H&S in the research context of work pressure and SWPs in construction in South Africa has been provided. The research method used (a research survey) has been described in Section 3. The findings have been presented and discussed descriptively in Sections 4 and 5, and concluding remarks have been made in Section 6.

2. Literature Review

2.1. Status of construction H&S in South Africa

Construction health and safety (H&S) matters, in line with best practices in developed countries, is an area that has attracted the attention of the South African government over several years (Emuze, 2019). However, Simukonda et al. (2020) confirmed that limited data concerning H&S management is available while implementing interventions among construction contractors is below par.

The sub-standard execution of H&S in South African construction has received the attention of scholars. For instance, Windapo and Oladapo (2012) declared that many South African contractors see the costs of complying with H&S regulations as unnecessary, extra financial burdens despite the evidence of the consequences of refusing to comply. Jaafar et al. (2018) argued that the purpose of H&S is to maintain a mechanism to emphasise the safety, health, and welfare of PiC. Windapo and Oladapo (2012) found that negligent attitudes, inadequate knowledge of H&S regulations by construction site employees, and the profit motive were the root causes of non-compliance with OHS legislation in South Africa. Windapo and Oladapo (2012) emphasised that the issue of non-compliance to reduce cost was because many small contractors did not include financial provisions for H&S requirements as part of deliberate practice to reduce prices quoted to win tenders. The marginal financial provision for H&S affects how PiC approaches SWPs and work pressure on site.

2.2. Causes of decline in adherence to SWPs

Construction H&S is viewed as an extra cost rather than an asset by management, especially by stakeholders in developing countries (Windapo and Oladapo, 2012). Many contractors believe that H&S is nothing more than an extra expense. The perception is that construction firms that invest in H&S can do so because they are profitable in business (Darabont et al., 2019). Darabont et al. (2019) avowed that employers tend to drive field workers to increase production. The field workers are made to believe that production must be sustained at any cost, but a decline in adherence to SWPs promotes construction accidents (Emuze, 2019).

Construction accidents are one of the outcomes of H&S violations. Eteifa and El-Adaway (2018) found that inadequate job-specific training, absence of fall-arrest systems, job site training, and lack of personal protective equipment (PPE) were the root causes of construction mishaps. Working out of sequence, taking shortcuts in site work, generating work defects, and losing the motivation to work have been identified as causes of H&S events on sites (Nepal et al., 2006). The findings are interrelated. The following were identified from past studies as factors that might influence a decline in adherence to SWPs: rushing to complete the job (i.e. work pressure) and job complexity (Rafindadi et al., 2022); individual characteristics (Nadhim et al., 2016); human error (Huang and Hinze, 2003); inappropriate use of defective PPE and poor safety communication (Lestari et al., 2019; Li et al., 2021); the mindset of workers towards H&S, failure to alert and warn, refusal to wear safety gadget, lack of knowledge about H&S, and skill for the job (Hamid et al., 2019). Other factors include a lack of safety knowledge about possible hazardous circumstances and workplace unfamiliarity (Wong et al., 2016). Unsafe actions of a co-worker(s), rowdy play among the field employees, operating machines unprofessionally (Abdelhamid and Everett, 2000) and abuse of drugs and alcohol (Dinges, 1995). In many countries, most construction workers are foreigners who might not understand the general or local language. Language barriers also might hinder the communication of H&S guidelines and, by extension, lead to a decline in adherence to SWPs on construction sites (Haslam et al., 2005).

2.3. Impact of work pressure on construction sites

In past studies, it has been established that work pressure in the workplace is a precursor to the conversion of hazards into risks (Emuze, 2019; Liang and Zhang, 2019; Yiu et al., 2019). Tunji-Olayeni et al. (2018) found that work pressure reduces productivity and project performance. In extreme cases, other effects include poor work environment, absenteeism, dissatisfaction with personnel, loss of experienced workers, illness, and loss of life. Also, work pressure can engender fatigue and musculoskeletal disorders among field workers on construction sites (Emuze, 2019). These disorders include weakness in various parts of the hands or legs, pain or stiffness of the body, difficulty bending the knees (Ibem et al., 2011), and difficulty squatting. Darabont et al. (2019) found that work pressure could promote psychological health problems in construction workers if not well managed. The possible outcomes are weak performance by field workers, increased illness rate, increased absenteeism, and increased workplace hazards. Darabont et al. (2019) affirmed that work pressure on site might result in other related diseases such as depression, mental discomfort, chronic weariness, and musculoskeletal discomfort. In a study by Nepal et al. (2006), losses in quality and productivity were identified as possible effects of work pressure on construction activities.

3. Research Method

This section explains the research method applied to investigate how work pressure drives a decline in adherence to SWPs and how this impacts construction safety. The research questions in the study mainly focus on "what" questions, which are exploratory to develop pertinent hypotheses and propositions for further studies (Yin, 2014). The exploratory case study (South African province) used a perception survey to assess the impact of work pressure on construction safety. A closed-ended questionnaire was used as the survey instrument to collect data for the study. The questionnaire structure was divided into two, with part 1 addressing demographic data while part 2 focused on the exploratory research questions. The research questions derived from a review of related literature elicited responses to questions such as:

- On a scale of 1 (never) to 5 (always), please rate the frequency in which you encounter the following issues when increasing labour productivity on a project. (Please note the 'Unsure' option)
- On a scale of 1 (never) to 5 (always), please rate the frequency in which you encounter the following detrimental effects of work pressure on artisans and general workers. (Please note the 'Unsure' option)
- On a scale of 1 (*never*) to 5 (*always*), please rate the frequency in which you encounter the following when

increasing labour productivity on projects. (*Please note the 'Unsure' option)*

With these above Likert scale types of questions (never [1], rarely [2], occasionally [3], sometimes [4], and always [5]), the questionnaire asked the respondents to assess how work pressure drives a decline in SWPs, the detrimental effects of work pressure that supervisors exert on artisans and workers, and how work pressures override safety systems to produce tolerance for shortcuts. The study's approach is not peculiar as other authors have used it. Mean scores (MSs) and standard deviations were used to describe the scale. The series of questions combined in the scale were derived from past studies on construction safety (please see Darabont et al., 2019, Dekker, 2019; Emuze, 2020; Sherratt, 2016; Smith, 2019). For instance, problematic behaviour in this study is described as 'unsafe acts' by Reason (2008).

This was in line with a similar survey conducted by Tunji-Olayeni et al. (2018). They administered a structured questionnaire among 35 craftspeople selected using a purposive sampling technique on construction sites in Lagos, Nigeria. Also, Plano-Clark and Creswell (2015) affirmed that a survey method is suitable for describing patterns in a large group of respondents. The sample frame for the present study included active construction role-players in a South African province. The respondents were frontline construction operatives with job titles that included foreperson, general worker, safety officer, and construction manager. These participants were engaged on active construction sites to ensure that they were competent to answer the questions based on their work experiences. From the 116 questionnaires administered, 50 questionnaires were returned and deemed suitable for analysis. This yielded a response rate of approximately 43%. This was considered adequate, according to Akintoye and Fitgerald (2000), who suggested that the benchmark response rate for the construction industry should be within 20%-30%. The Statistical Package for Social Sciences (SPSS) was used to analyse the data, as presented in Tables 2, 3, and 4. The Likert Scale ranged from 1 (Never) to 5 (Always).

4. Findings

Table 1 contains a summary of the respondents' demographic information, which shows that the least academic qualification was a diploma graduate. No less than 94% of the respondents held a minimum of a bachelor's degree. The participants in the survey include general workers, forepersons, H&S officers, and owners of small-sized construction firms. Therefore, the respondents' theoretical knowledge and their lived work experience on various construction sites gave credibility to the results. SPSS data analyses were conducted to rank the variables based on their mean scores (MSs) related to significant constructs (such as work pressure).

4.1. Influence of work pressure on site

Table 2 shows the respondents' ranking of the factors influencing a decline in adherence to SWPs through work pressures. In terms of percentage replies on a scale of 1 (Never) to 5 (Always) and an MS range from 1.00 to 5.00, Table 2 shows the respondents' perceptions of how work pressures promote a decline in adherence to SWPs. Notably, all the MSs were over 3.00, indicating that the respondents frequently encountered these aspects in their line of duty. Such occurrences might enhance efficiency in the short term but negatively impact it in the long term. As shown in Table 2, high staff turnover was ranked 1st, while the lowest factor was excessive overtime. High staff turnover was notable among the conditions determining how work pressures affected SWPs, with 50.0% of respondents saying it always happened. Lack of operatives, high management objectives, and excessive overtime were also significant in this context.

4.2. Effects of work pressure on PiC on site

In terms of percentage replies on a scale of 1 (Never) to 5 (Always) and an MS range from 1.00 to 5.00, Table 3 shows the respondents' views on the detrimental effects of work pressure that supervisors exert on artisans and construction workers on sites. It is notable that all the MSs were over 3.00 except for one. The MSs thus indicated that the respondents encounter the issues frequently on projects.

Table 1. Demographic information

Position			Academic qualification		
Employment	Percentage	Number	Qualification	Percentage	Number
Senior management	30.8	15	Diploma	6.0	3
Middle management	28.6	14	Bachelor's Degree	66.0	33
Junior Management	20.4	10	Master's Degree	28.0	14
Non-managerial	22	11			
Total	100.00	50		100.00	50

Table 2. How work pressure drives a decline in adherence to SWPs

Aspects	Responses (%)						MS	Rank
	Unsure	1	2	3	4	5		
High staff turnover	6.0	2.0	10.0	8.0	24.0	50.0	3.92	1
Lack of operatives	4.0	4.0	14.0	26.0	36.0	16.0	3.34	2
High management targets/expectations	14.0	0.0	20.0	6.0	40.0	20.0	3.18	3
Excessive overtime	16.0	0.0	12.0	18.0	34.0	20.0	3.14	4

Table 3. Effects of work pressure that supervisors exert on artisans and workers

Aspects	Responses (%)						MS	Rank
	Unsure	1	2	3	4	5		
Emotional behaviour	0.0	0.0	0.0	16.0	56.0	28.0	4.12	1
Problematic behaviour	0.0	0.0	8.0	18.0	34.0	40.0	4.06	2
Work stress	0.0	0.0	20.0	24.0	24.0	32.0	3.68	3
Work fatigue	0.0	0.0	12.0	26.0	44.0	18.0	3.68	3
Demotivation	0.0	0.0	4.0	46.0	30.0	20.0	3.66	5
Difficulty in concentration	14.0	0.0	14.0	28.0	38.0	20.0	3.36	6
Interpersonal conflict	18.0	0.0	0.0	52.0	30.0	0.0	2.76	7

Table 4. Situations that result in incremental tolerance of short-cuts

Situation	Responses (%)						MS	Rank
	Unsure	Never………………. Always						
		1	2	3	4	5		
Management pressure to complete projects	0.0	0.0	8.0	24.0	22.0	46.0	4.06	1
Reduced mental alertness	0.0	0.0	12.0	26.0	40.0	22.0	3.72	2
Shortcuts to meet productivity	6.0	0.0	0.0	26.0	48.0	20.0	3.70	3
Poor inter-personal relationship	0.0	0.0	14.0	34.0	32.0	20.0	3.58	4
Over-ride of SMS	34.0	0.0	0.0	34.0	22.0	12.0	2.44	5

Emotional behaviour was ranked first among the conditions that identify the detrimental effects of work pressure that supervisors exert on artisans and construction workers on sites, with 56% of the respondents saying it happened often. Based on the respondents' perceptions, problematic behaviour, work stress, work fatigue, demotivation, difficulty in concentration, and interpersonal conflict were also notable. In effect, the respondents thought most work pressure came from the on-site management and supervisors. It is pertinent that stakeholders put measures in place to mitigate these effects on construction workers because of the on-site consequences for the workers and production.

In terms of percentage replies on a scale of 1 (Never) to 5 (Always), and an MS range from 1.00 to 5.00, Table 4 shows the respondents' views on how work pressures override the SMS to result in incremental tolerance for shortcuts that lead to productivity increases in the short term. It was notable that all the MSs were over 3.00 except for one. Thus, the data indicated that over-riding the SMS was experienced often instead of never. Management pressure to complete projects was ranked first among the conditions that identify the detrimental effects of work pressure that supervisors exert on artisans and construction workers on sites, with 46% of responses indicating that this always occurred. Reduced mental alertness, shortcuts to meet productivity, and poor interpersonal relationships on sites were also notable based on the respondents' perspectives.

In terms of percentage replies on a scale of 1 (Never) to 5 (Always) and an MS range from 1.00 to 5.00, Table 5 shows the respondents' views on how improper application of H&S plans influences events on construction sites. The table shows three notable effects: approval delays (linked to inspections and audits), worker fatigue, and unsafe working practices. Apart from the insights provided by the responses to the Likert Scale questions through Tables 2 to 5, the respondents were also requested to indicate 'yes' or 'no' on statements that addressed work pressure and deviations from SWPs (safety violations).

In terms of the 'yes' or 'no' responses of the participants, Table 6 shows that most reactions to the statements were 'yes'. The respondents concurred that workers contribute to the hazard and risks that might lead to low on-site production. They also believed that work pressure that overrides the SMS occurs on sites, and taking shortcuts is not far behind when such pressure occurs. Indeed, all the statements in Table 6 received more than 50% 'yes' responses, so it is suggested that work pressure is a familiar phenomenon to the respondents based on their work experience.

5. Discussion

The findings indicated that work pressure drives a decline in adherence to SWPs. The plight of PiC, especially H&S, cannot be ignored when the effects of work pressure are considered. The descriptive study affirmed that work pressure increases the threat to safety on site.

The factors that influence the decline in adherence to SWPs, and how work pressure affects workers, as revealed in Tables 2 and 3, showed that high management targets/expectations and lack of operatives were significant. These factors might be related to human error, and refusal to mitigate them could lead to fatalities on construction sites. The findings are confirmed by Rafindadi et al. (2022), who asserted that, sometimes, pressure from management or a supervisory team to complete the job could influence a decline in adherence to SWPs. A reduction in commitment to SWPs creates an environment that leads to near misses and accidents, although most of these acts linked to human errors are avoidable (Huang and Hinze, 2003).

Also, regarding unsafe working practices and engagement of incompetent workers, the findings support those of Dinges (1995), who identified abuse of drugs and alcohol as a cause of practices that make sites less safe. In studies by Lestari et al. (2019) and Li et al. (2021), the use of defective PPE and poor H&S communication were possible factors that could lead to H&S safety violations because of work pressure.

Table 5. Effects of improper application of health and safety plans on construction sites

Factor	Responses (%)						MS	Rank
	Unsure	1	2	3	4	5		
Approval delays	0.0	2.0	12.0	30.0	56.0	0.0	3.64	1
Worker Fatigue	6.0	0.0	0.0	22.0	72.0	0.0	3.54	2
Unsafe working practices	0.0	0.0	10.0	46.0	44.0	0.0	3.34	3
Use of incompetent workers	0.0	14.0	18.0	24.0	44.0	0.0	2.98	4
Industrial protest (strike)	0.0	0.0	38.0	48.0	14.0	0.0	2.76	5
Sick workers on site	10.0	10.0	8.0	60.0	12.0	0.0	2.54	6
Unrecorded H&S events	0.0	0.0	12.0	38.0	50.0	0.0	2.38	7
Mistakes in H&S procedures	0.0	0.0	14.0	60.0	26.0	0.0	2.12	8
Substance abuse	18.0	54.0	28.0	0.0	0.0	0.0	1.1	9

Table 1. Views on work pressures and other SWP aspects

Statement	Yes	No
	1	2
Do workers' behaviour contributes to hazards, risks, and low production on-site?	86.0	14.0
Is there work pressure that overrides SMS to result in incremental tolerance for shortcuts that lead to productivity increases in the short term?	84.0	16.0
Do operatives neglect the H&S of others when increasing labour productivity?	82.0	18.0
Does work pressure drive a decline in SWPs and drift to failure?	74.0	26.0
Do operatives understand who is responsible for H&S on-site?	70.0	30.0
Are there detrimental effects caused by work pressure supervisors exert on artisans and construction workers on-site?	64.0	36.0
Do workers understand the importance and application of health and safety plans on construction sites?	56.0	46.0

Also, Hamid et al. (2019) observed that work pressure could influence the safety mindset of workers, their failure to be alert and warn, and their refusal to wear required PPE. A close look at the data suggests that measures to mitigate the possible causes of work pressure cannot be left in the hands of contractors only. Instead, an all-inclusive approach to address this threat to construction safety is required. The approach should investigate underlying human factors, which are mainly about the working conditions in an organisation and how these conditions affect people (Bridger, 2022). Just as human factors take a systems approach to investigation in which errors and violations are implicated, the same approach should be used to unpack how work pressure affects PiC on site. The idea is to understand the actions of PiC in the frontline of construction, the working conditions where they work and the rationale for management actions that are usually responsible for the extent and nature of the work pressure in the organisation.

In addition, the descriptive results suggested that the outcome of work pressure could lead to emotional and problematic behaviours. Emotional behaviour is a mental state underpinned by impulsiveness, which is the direct opposite of mindfulness (Reason, 2008). Individual mindfulness might lead to systemic resilience at the organisational level on a site. The issue concerns preparedness to override gaps in SMS defences in the workplace (Reason, 2008). The mental health issue is associated with physiological shifts that are detrimental to construction H&S. For example, a wave of anger caused by a decision based on emotion rather than logic during site work is an example of problematic behaviour. The type of behaviour that might hinder social relations and H&S communication causes harm on construction sites. The findings revealed that conditions might degenerate further into psychological health situations, as Darabont et al. (2019) mentioned. Darabont et al. (2019) discovered that work pressure could cause psychological health problems among PiC if not well managed.

Regarding work stress and fatigue, the findings showed that unexpected responsibilities often trigger work stress or the lack of laid-down procedures for the work schedule. Or the lack of skills and knowledge to execute the task. The outcome results mostly in conflict among co-workers or triggers health challenges such as high blood pressure. Regarding work fatigue, the findings revealed that fatigue is connected mainly to not following the SWPs. Apart from being counter-productive in the basics over the long term, it might expose the workers to safety and occupational health issues if not checked. The findings agree with Tunji-Olayeni et al. (2018), who outlined a similar impact of work pressure on PiC.

6. Limitations and areas for further study

The limitation of the study was that the researcher used a closed-ended questionnaire survey approach in a single province in South Africa. A broader statistical generalisation of the results is desirable in future studies. However, the ideas discussed based on the results apply to other settings in developing countries. It is argued that case-based research in other places will enrich what is known about work pressure and SWPs.

Yin (2014: 68) says, "an analytic generalisation consists of a carefully posed theoretical statement, theory, or proposition. The generalisation can take the form of a lesson learned, working hypothesis, or other principles that are believed to apply to other situations." In the context of the reported study here, while South Africa can be deemed the case study, the results are analytically applicable to international construction management in other countries. For instance, theoretical propositions from the results, such as 'improper application of H&S plans that lead to unsafe working practices and worker fatigue', should be mitigated and researched on every project site, regardless of region or country.

7. Conclusion and Recommendations

This article is a report based on a study of how work pressure drives a decline in adherence to SWPs and how this impacts construction. The data showed that factors related to work pressure influence the commitment to SWPs. Also, the results indicated that emotional behaviour, work stress and fatigue, demotivation, and interpersonal conflict are the significant effects of work pressure on PiC. Based on these conclusions, it is recommended that an all-inclusive approach is a key to mitigating work pressures associated with construction sites. Such an approach should tie human factors with working conditions with a systematic view. This approach is relevant to developing and developed countries, where the link between work pressure and safety performance is established. Site management should empower frontline workers to recognise possible causes of work pressure and prevent them on construction sites. Apart from the training of PiC, H&S professionals on significant construction sites should watch out for signs of work pressures that erode SWPs. Doing so will allow early detection and prevention.

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Author Contributions

Fidelis Emuze contributes to conceptualization, methodology, analysis, investigation, data collection, manuscript editing, supervision, and project administration.

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Institutional Review Board Statement

Institutional Review Board (IRB) approval was secured. The IRB at the Central University of Technology, Free State in South Africa, is called FRIC Ethics. The approval number is FRIC-8/2021. The date of approval is 26th July 2021.

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Fidelis Abumere Emuze, PhD, is a Professor and Head of the Department of Built Environment at the Central University of Technology, Free State (CUT), South Africa. Lean construction, health, safety, and sustainability form the primary research interest of Dr Emuze, who is a National Research Foundation (NRF) C-rated researcher that has published over 250 research outputs and received over 27 awards and recognitions. Dr Emuze holds diplomas and degrees in Built Environment, Civil Engineering, Construction Management and Higher Education. Dr Emuze is the editor of *Value and Waste in Lean Construction*, *Valuing People in Construction*, and co-editor of *Construction Health and Safety in Developing Countries*. Dr Emuze authored *Construction Safety Pocketbook for South Africa* in 2020. Dr Emuze is the International Coordinator of CIB W123 – People in Construction Working Commission.