EPiC Series in Built Environment

Volume 5, 2024, Pages 876–884

Proceedings of 60th Annual Associated Schools of Construction International Conference

Hidden Iceberg of Construction Safety: Assessing Near-Miss Recognition Performance under Stress through a Personality Lens

Shashank Muley, Ph.D. Candidate. and Chao Wang, Ph.D.
Louisiana State University
Baton Rouge, LA

The construction industry is widely acknowledged as hazardous and stressful, necessitating proactive measures to mitigate accidents and fatalities. This study investigated the influence of the Big Five personality traits on construction workers' recognition of the Fatal Four near-miss scenarios under different stressor conditions. Using an eye-tracking experiment conducted in a controlled environment, 35 participants were exposed to well-balanced stimuli images derived from actual construction sites. Participants completed self-reported questionnaires to assess their personality traits, and their recognition performance was recorded and analyzed using a wearable eye tracker. The findings revealed a statistically significant difference in visual attention for participants in non-stress versus stressful conditions. Individuals with low (neuroticism and openness) and high (agreeableness and conscientiousness) displayed enhanced alertness during the stressor condition. Therefore, this study provides empirical evidence of the impact assessment between stressor conditions and personality traits on near-miss recognition in the construction industry. The results open avenues for developing personalized safety training programs tailored to individuals with lower near-miss identification abilities under stress, thereby fostering a robust safety culture within the construction sector.

Key Words: Personality, Workplace Stress, Visual Attention, Eye-tracking, Near-miss

Introduction

Despite continuous efforts to enhance construction safety, the global construction industry remains one of the most dangerous (Choi, Hwang, & Lee, 2017). Although comprising only 5.1% of the U.S. workforce, it accounted for over 19% of total fatal occupational injuries in 2016 (BLS, 2017). Previous studies estimate that the annual cost of construction accidents exceeded $11 billion in 2002, constituting 15% of the costs for all private construction sector fields (Waehrer, Dong, Miller, Haile, & Men, 2007). Fatalities in the construction sector primarily occur in falls, caught-in/between incidents, struck-by accidents, and electrocutions. Recent efforts have been made to enhance the hazard recognition capabilities of construction workers through the identification, analysis, and implementation of strategies. Falls, caught-in/between incidents, struck-by accidents, and electrocutions are recognized as the key areas contributing to most fatalities in the construction sector. Regulatory organizations have taken steps to reduce these incidents by bolstering safety programs, implementing hybrid training, and enforcing strict guidelines. The dynamic construction workplace introduces a wide range of safety hazards that must be identified and mitigated for comprehensive workplace safety. Despite ongoing efforts, the literature review suggests occasional failures among construction workers in recognizing acceptable safety hazards. A study on U.S. construction workers revealed a 50% failure rate in recognizing work-related safety hazards, emphasizing the need for continued improvement in hazard recognition training and strategies (Jeelani, Albert, Han, & Azevedo, 2019). This failure to identify safety hazards exposes workers to an increased risk of incidents and injuries, including life-threatening, catastrophic events. The Occupational Safety and Health Administration (OSHA) defines a near-miss as "an incident where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred" (OSHA, 2002). Therefore, the recognition of near-misses in construction, which serves as a precursor or indicator of potential safety hazards, incidents, or injuries, is of great importance for improving workplace safety. OSHA widely categorizes near-misses in their "Near-Miss Incident Report Form" as Unsafe Acts and Unsafe Conditions (OSHA, 2022). Unsafe acts in occupational accidents are consequences of the unsafe behavior of construction workers. Human factor-driven unsafe behavior is the prominent reason for accidents in the construction industry (Haslam et al., 2005). Therefore, this study evaluates the influence of workers' personality indicators on their near-miss recognition performance under stress. The outcome of this study will provide a better understanding of how workers with low and high personality traits perform during near-miss recognition tasks under stress.

Literature Review

Importance of Near-miss and Visual Sensing in Construction Safety

In the area of construction research, many studies have defined near-miss as an event that could have led to a more severe condition but did not result in loss or injury (Lu, Wu, Shao, Liu, & Wang, 2019); (Winkler, Perlman, & Westreich, 2019). It can also be seen as a potential incident that could have caused greater damage or injury but did not result in any injuries or damage. Unidentified and unreported near misses can be associated with unsafe acts, potentially leading to major incidents or injuries on construction sites. Therefore, it is vital that all individuals working in a construction environment can effectively identify near misses to mitigate the risk of accidents. The Construction Focus Four program, also known as the Construction Fatal Four program, is one of the most influential programs designed and promoted by OSHA. Its development aims to improve hazard recognition and lower the injury rate by increasing attention to common causes of fatal incidents, such as falls, struck-by, caught-in/between, and electrocution hazards. The goal of the Construction Fatal Four program is to reduce injury rates; however, statistics from the U.S. Bureau of Labor Statistics suggest more than 25000 fatal injuries were reported between 2016 and 2020 (BLS, 2021). Fatalities affiliated with fatal four also show a similar trend; there were more than 6000 fatalities reported between 2016 and 2020 (CPWR, 2022). Improving near-miss detection and reporting is vital to enhance construction workers' hazard recognition capability. In recent years, regulatory programs and guidelines have been established to boost safety in the construction industry. Statistics and literature reviews indicate a higher risk of construction accidents and fatalities than other sectors. Employers have implemented preventive measures such as training, active reporting, and automated hazard reporting systems to minimize worker exposure to hazards. Improvements in hazard detection through training, visual sensing, machine learning, and reporting have the potential to reduce accident rates. However, enhancing hazard detection requires improving construction workers' near-miss recognition capabilities. There is a robust relationship between cognitive behavior and visual attention, which is why visual sensing, utilizing eye-tracking technology, is widely employed in various fields of study (Hasanzadeh, Esmaeili, & Dodd, 2018).

Monitoring visual attention through eye movements provides a better understanding of how cognitive behavior influences an individual's attention and decision-making process. Gazing behavior and personality traits are also correlated, as evidenced by a strong relationship demonstrating visual information processing and social gazing (Perlman, Sacks, & Barak, 2014). In eye-tracking studies, the recognition performance of participants in the form of fixation duration is utilized as the dependent variable in previous studies to quantify and evaluate visual behavior (Murray & Janelle, 2003). A lower number of fixations with longer duration are indicators of a knowledge-driven and less random search strategy, resulting in better near-miss recognition performance to mitigate accidents and loss of property (Gegenfurtner et al., 2020).

Workplace Stressors

Construction workplace personnel are exposed to both active and passive factors that can compromise individual productivity and safety on a large scale. A critical aspect of fostering a safe construction environment is hazard mitigation, relying on the active engagement of individuals in hazard recognition and decision-making processes. Each individual on the site expends a significant amount of internal cognitive resources to handle and evaluate external information (Shaw & Shaw, 1977). A large amount of cognitive load can be manifested in multiple dimensions in terms of mental load, mental effort, workplace stress, and work performance, as described by (Paas & Van Merriënboer, 1994) in a general model. Furthermore, heightened mental stress can disrupt workers' focus during hazardous situations, hindering their ability to identify, intervene, and report near-misses. Unexpected mental stress increases the demand for workers' mental resources, leading to excess mental load and making it challenging to differentiate crucial information from secondary details, ultimately diminishing situational awareness (Wickens, 2002). Due to the dynamic and activity-demanding nature of the construction workplace, workers are exposed to mental stressors that impact their attention and perception of risk (Chen, Song, & Lin, 2016). Given the limited empirical research on the influence of mental stress on workers' near-miss recognition performance, this study assesses its impact on fatal four near-misses. Understanding the relationship between mental stress and near-miss recognition is crucial for developing effective safety interventions and coping mechanisms in the context of construction safety.

Impact on Safety Behavior

The construction industry, being labor-intensive, places a paramount emphasis on the safety of workers. Continuous innovations and modifications to safety protocols aim to ensure a secure workplace for construction personnel. While these upgrades enhance hazard control for workplace safety, human beings remain susceptible to risks when encountering unsafe conditions or engaging in unsafe acts. Unsafe acts are inherent in human behavior and are often driven by personality traits. Psychological research suggests interactive effects between personality traits and work behavior, highlighting the need to investigate the impact of construction workers' personalities on their interaction with construction environments. Personality's most common definition was introduced by Allport in 1937: "Personality is the dynamic organization within the individual of those psychological systems that determine his characteristics, behavior and thoughts" (Allport, 1937). In psychology, numerous types of research have been conducted to discover the nature and traits of human personality, as it is vital to understand human personality to explain and predict human risk-taking behavior (Di Fabio & Saklofske, 2018; Mishra & Sritharan, 2012). There has been a constant effort to conduct quantitative research to establish a relationship between personality traits and safety outcomes (Beus, Muñoz, & Arthur Jr, 2015); (Yuan, Li, Xu, & Huang, 2018). The Big Five personality trait model is one of the most prevalent personality assessment methods. In 1992, the term "Big Five" personality traits included (extroversion, agreeableness, conscientiousness, openness, and neuroticism) were named by Goldberg. The 40-item inventory of adjectives introduced by (Saucier, 1994) addressed shortcomings of other counterpart personality tests. 40-item mini-marker test qualifies as a good measurement of robustness and time constraints. All participants can complete this test in approximately 5 minutes and have the ability to produce reasonable Big Five factors in small samples (Hasanzadeh, Dao, Esmaeili, & Dodd, 2019). Based on the literature review, a 40-item Inventory developed by (Saucier, 1994) was adopted to evaluate participants' personalities for this study.

Methodology and Experiment Procedure

The study employed a within-subject experimental design where participants were tasked with identifying fatal four near misses from stimuli images collected under non-stress (Baseline) and Stress (Stressor) conditions. All participants completed baseline and stressor condition trials in randomized order and on separate day; this facilitated the reduction of order and carryover effect. Prior to the experiment, participants completed a pre-experiment task, engaging in a demographic questionnaire, a Mini-Marker Personality Survey, and a Near-miss Construction Fatal Four Training video. The experimental phase involved setting up and calibrating eye-tracking equipment, including the E4 wristband for Electrodermal Activity (EDA) data and Tobii Pro Glasses 2 for eye-tracking metrics. Calibration for all devices was rigorously performed before each experimental trial. Following the sensor calibration process, participants were given instructions to complete two experimental trials: During the non-stress trial, participants viewed a documentary titled "World Class Trains – The Venice Simplon Orient Express." This documentary is recognized as emotionally neutral, and researchers have confirmed that watching it does not induce any external stress on the viewer (O'Keeffe, Hodder, & Lloyd, 2020; Umer, Yu, & Antwi Afari, 2022). After watching the documentary, the participants were asked to complete the near-miss eye-tracking activity. In the mental stress trial, participants were asked to transform a four-digit number while sitting at a self-selected pace (Kahneman, 1973). The process was continued until the prescribed time elapsed. If the participant responded with the wrong conversion, they were notified. After completing the mental stress activity, participants completed the eye-tracking activity with different sets of stimuli for near-miss identification. Eye-tracking matrices were extracted for each pre-defined Fatal Four Area of Interest (AOI) to assess participants' near-miss recognition performance. The visual sensing data processing was conducted using Tobii Pro Lab version 1.142.1, offering a comprehensive platform with a combination of visual and analytical tools. Fixation matrices for each participant were extracted from the recording of near-miss recognition activities mapped on pre-defined AOIs using the I-VT fixation filter, which provides a threshold classification of 30 degrees/second for gaze data. This process was carried out for all participants under both non-stress and stress conditions.

Data Analysis

The selection of the eye-tracking matrix depended on the identification process and cognitive demand investigated. In this study, the fixation-related matrix selected to evaluate recognition performance was based on visual attention is fixation duration. Fixation duration was extracted for the Near-Miss AOI (N.M. - Fixation Duration) and the Non-Near-Miss AOI (N-NM - Fixation Duration). The independent variables in this study are participants' Big Five personality scores, collected using a Mini-Marker personality questionnaire. Cronbach's alpha reliability analysis was conducted to test the internal consistency ($\alpha > 0.70$) of the parameters. The Big Five Personality traits (Extraversion, Agreeableness, Conscientiousness, Neuroticism, Openness/Intellect) were categorized as follows: below the 25th percentile as "low," between the 25th percentile and the 75th percentile as "moderate," and higher than the 75th percentile as "high" for personality trait groups. For analysis, extreme groups (low vs. high) were taken into consideration. To determine the proper statistical method for comparing eye-tracking matrices between non-stress and stressor conditions, exploratory data analysis was conducted. The Shapiro-Wilk's normality test and the homogeneity of variances were employed across all data sets to assess parametric/non-parametric method usage. Results from the tests indicate that fixation duration data was not normally distributed ($p < 0.05$ as per the Shapiro-Wilk's test). The analysis results from the non-parametric related sample (Wilcoxon Signed Rank Test) are presented in the section below.

Results

The statistical analysis results indicate a statistically significant difference in NM-fixation duration for participants' near-miss recognition when comparing non-stress and stress conditions (Z = -4.061, p-value < 0.001). Similarly, there was a statistically significant difference in participants' fixation duration for missed near-misses (N-NM-Fixation Duration) between non-stress and stress conditions (Z = -4.477, p-value < 0.001).

Table 1

Change in fixation duration across stress condition (Non-stress versus Stress) and between different AOIs (N.M. and N-NM)

	NM-Fixation Duration		**N-NM-Fixation Duration**	
Condition	**Test Statistics (Z)**	**Significance (p-value)**	**Test Statistics (Z)**	**Significance (p-value)**
Non-Stress Vs Stress	-4.061	<0.001*	-4.477	<0.001*

The stressor condition had a pronounced effect on participants' visual attention. For NM-Fixation Duration, the mean for the stress condition (1.904 sec) was lower than that for the non-stress condition (2.586 sec). Likewise, for the N-NM-Fixation Duration, the mean for the stressor condition (12.503 sec) increased compared to the non-stress condition (11.234); one explanation for the increase in fixation duration for non-near-miss is that as stress level increased, participants got distracted which led to attention allocation on non-near-miss AOIs (see Table 1 and figure 1). Therefore, participants' near-miss recognition performance decreased when exposed to a stressful condition, as visualized in Figure 1.

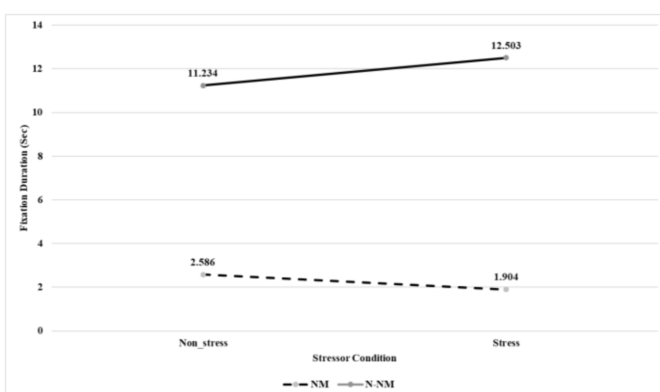

Figure 1. Mean for Stressor Condition vs Fixation duration (N.M. & N-NM)

Low vs High Personality Impact on Visual Attention

To assess the impact of Big Five personality traits on visual attention in near-miss recognition performance, each personality group (low & high) was examined based on their visual attention measures. Table 2 reveals that the low personality groups for extraversion (Z = -2.028, p-value < 0.043), agreeableness (Z = -2.571, p-value < 0.010), and conscientiousness (Z = -2.366, p-value < 0.018) were statistically significant. However, neuroticism and openness were not significant with approximately equivalent means. Therefore, due to the similar mean for these two personality traits, it can be concluded that the low neuroticism and low openness personality group performs better under stressful conditions compared to others.

Table 2

Change in fixation duration across stress condition (Non-stress versus Stress) for Low and high Personality level participants

		Low Personality Level		High Personality Level	
Personality	**Condition**	**Test Statistics (Z)**	**Sig. (p-value)**	**Test Statistics (Z)**	**Sig. (p-value)**
Extraversion	Non-Stress Vs. Stress	-2.028	0.043*	-2.52	0.012*
Agreeable	Non-Stress Vs. Stress	-2.571	0.010*	-0.199	0.842
Conscientious	Non-Stress Vs. Stress	-2.366	0.018*	-1.848	0.065
Neurotic	Non-Stress Vs. Stress	-0.904	0.366	-3.081	0.002*
Openness	Non-Stress Vs. Stress	-1.202	0.229	-2.199	0.028*

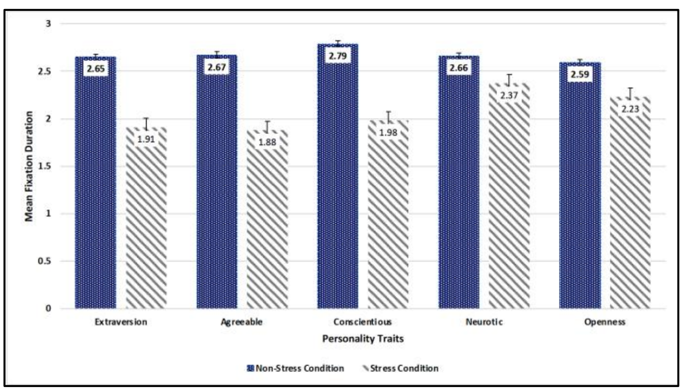

Figure 2. Mean fixation duration for low levels of personality traits (non-stress vs stress condition)

Likewise, when assessing the impact of the high personality group on visual attention for near-miss recognition performance based on their visual attention measures, equivalent results were observed. Table 2 reveals that the high personality groups for extraversion (Z = -2.52, p-value < 0.012), neuroticism (Z = -3.081, p-value < 0.002), and openness (Z = -2.199, p-value < 0.028) were statistically significant. However, agreeableness and conscientiousness were not significant. Therefore, due to the similar mean for these two personality traits, it can be concluded that the highly agreeable and conscientiousness personality group performs better under stressful conditions compared to others. Additionally, descriptive statistical comparison of mean fixation duration for low and high personality levels across non-stress and stress conditions showcase a decreasing trend in recognition performance for participants with lower levels of extraversion, agreeable, and conscientiousness personality traits (figure 2) this is in alignment with previous eye-tracking studies that indicated extrovert worker return their attention less frequently to hazards (Hasanzadeh et al., 2019). Similarly, workers with low agreeable and conscientious personalities are hostile and careless, leading to higher risk-taking behaviors (Clarke & T Robertson, 2005; Rauthmann, Seubert, Sachse, & Furtner, 2012). Participants with higher levels of extraversion, neuroticism, and openness have reduced recognition performance when exposed to stressful conditions (figure 3).

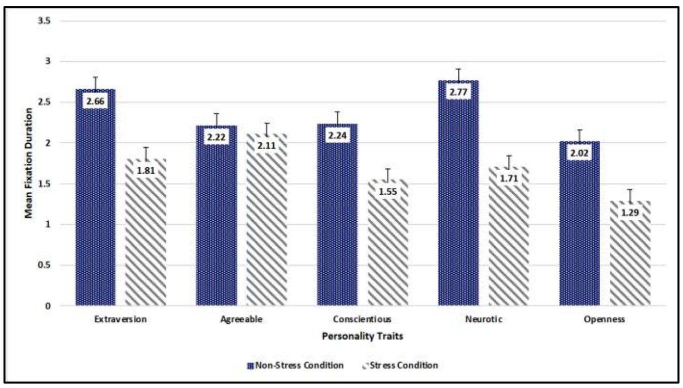

Figure 3. Mean fixation duration for high levels of personality traits (non-stress vs stress condition)

Conclusion and Future Research

The construction industry's constant hazards demand a focus on preventive measures. Identifying and addressing near-miss incidents is crucial for safety. Workers' unsafe actions, including a lack of attention and failure to correctly identify potential near-miss incidents under stressful conditions, can lead to recordable injuries, property damage, and even loss of life. Therefore, this study examined how personality traits can serve as psychological indicators to evaluate workers' near-miss incident recognition performance under non-stress and stressful conditions. Individuals with low neuroticism and openness, as well as high agreeableness and conscientiousness, showcased better near-miss recognition performance under stress compared to other personality traits. These results are in alignment with previous personality and hazard detection studies indicating workers with lower neurotic behavior, highly agreeable attributes, and greater conscientious traits are more likely to bring their attention toward hazardous areas (Clarke & T Robertson, 2005; Teng, Chang, & Hsu, 2009). The results of this study will provide a foundation for personalized intervention strategies and training to improve near-miss identification and reporting. The knowledge gained can be used to implement early warning signs and measures for preventing human error. Study outcomes support personalized interventions for improved near-miss identification and reporting. Future research should explore physiological indicators and personality traits in workers' risk perception of near-miss scenarios. Dynamic near-miss scenarios through virtual or mixed reality could offer realistic experimental settings. The study didn't evaluate physiological indicators' impact on near-miss attentiveness. Future research could investigate the near-miss recognition performance of workers using physiological indicators (e.g., heart rate, BMI, skin conductance, etc.) and conditions (e.g., environmental conditions, physical conditions, heat stress, etc.) that replicate actual site conditions, providing experimental evidence for personality correlation.

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No. 2222881. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Allport, G. W. (1937). *Personality: A psychological interpretation*.

Beus, J. M., Muñoz, G. J., & Arthur Jr, W. (2015). Personality as a multilevel predictor of climate: An examination in the domain of workplace safety. *Group & Organization Management, 40*(5), 625-656. doi:https://doi.org/10.1177/1059601115576597

BLS. (2017). National Census of Fatal Occupational Injuries in 2016.

BLS. (2021). *Census of Fatal Occupational Injuries* Retrieved from https://www.bls.gov/iif/fatal-injuries-tables.htm

Chen, J., Song, X., & Lin, Z. (2016). Revealing the "Invisible Gorilla" in construction: Estimating construction safety through mental workload assessment. *Automation in Construction, 63*, 173-183. doi:https://doi.org/10.1016/j.autcon.2015.12.018

Choi, B., Hwang, S., & Lee, S. (2017). What drives construction workers' acceptance of wearable technologies in the workplace?: Indoor localization and wearable health devices for occupational safety and health. *Automation in Construction, 84*, 31-41. doi:https://doi.org/10.1016/j.autcon.2017.08.005

Clarke, S., & T Robertson, I. (2005). A meta-analytic review of the Big Five personality factors and accident involvement in occupational and non-occupational settings. *Journal of Occupational and Organizational psychology, 78*(3), 355-376. doi:https://doi.org/10.1348/096317905x26183

CPWR. (2022). Construction Focus Four. Retrieved from https://www.cpwr.com/research/data-center/data-dashboards/construction-focus-four-dashboard/

Di Fabio, A., & Saklofske, D. H. (2018). The contributions of personality and emotional intelligence to resiliency. *Personality and Individual Differences, 123*, 140-144.

Gegenfurtner, A., Boucheix, J.-M., Gruber, H., Hauser, F., Lehtinen, E., & Lowe, R. K. (2020). The gaze relational index as a measure of visual expertise.

Hasanzadeh, S., Dao, B., Esmaeili, B., & Dodd, M. D. (2019). Role of personality in construction safety: investigating the relationships between personality, attentional failure, and hazard identification under fall-hazard conditions. *Journal of Construction Engineering and Management, 145*(9), 04019052. doi:https://doi.org/10.1061/(Asce)Co.1943-7862.0001673

Hasanzadeh, S., Esmaeili, B., & Dodd, M. D. (2018). Examining the Relationship between Construction Workers' Visual Attention and Situation Awareness under Fall and Tripping Hazard Conditions: Using Mobile Eye Tracking. *Journal of Construction Engineering and Management, 144*(7), 04018060. doi:doi:10.1061/(ASCE)CO.1943-7862.0001516

Haslam, R. A., Hide, S. A., Gibb, A. G., Gyi, D. E., Pavitt, T., Atkinson, S., & Duff, A. R. (2005). Contributing factors in construction accidents. *Applied ergonomics, 36*(4), 401-415. doi:https://doi.org/10.1016/j.apergo.2004.12.002

Jeelani, I., Albert, A., Han, K., & Azevedo, R. (2019). Are visual search patterns predictive of hazard recognition performance? Empirical investigation using eye-tracking technology. *J. Constr. Eng. Manag*, *145*(1), 04018115.

Kahneman, D. (1973). *Attention and effort* (Vol. 1063): Citeseer.

Lu, H., Wu, T., Shao, Y., Liu, Y., & Wang, X. (2019). Safety-specific leadership, goal orientation, and near-miss recognition: The cross-level moderating effects of safety climate. *Frontiers in psychology, 10*, 1136. doi:https://doi.org/10.3389/fpsyg.2019.01136

Mishra, S., & Sritharan, R. (2012). Personality and behavioral outcomes associated with risk-taking are accurately inferred from faces. *Journal of Research in Personality, 46*(6), 760-764. doi:https://doi.org/10.1016/j.jrp.2012.06.007

Murray, N. P., & Janelle, C. M. (2003). Anxiety and performance: A visual search examination of the processing efficiency theory. *Journal of Sport and Exercise psychology, 25*(2), 171-187. doi:https://doi.org/10.1123/jsep.25.2.171

O'Keeffe, K., Hodder, S., & Lloyd, A. (2020). A comparison of methods used for inducing mental fatigue in performance research: individualised, dual-task and short duration cognitive tests are most effective. *Ergonomics, 63*(1), 1-12. doi:10.1080/00140139.2019.1687940

OSHA. (2002). Job hazard analysis.

OSHA. (2022). Near Miss Reporting Policy Retrieved from https://www.osha.gov/safety-management/additional-resources-by-topic

Paas, F. G., & Van Merriënboer, J. J. (1994). Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of educational psychology, 86*(1), 122. doi:https://doi.org/10.1037/0022-0663.86.1.122

Perlman, A., Sacks, R., & Barak, R. (2014). Hazard recognition and risk perception in construction. *Safety Science, 64*, 22-31. doi:https://doi.org/10.1016/j.ssci.2013.11.019

Rauthmann, J. F., Seubert, C. T., Sachse, P., & Furtner, M. R. (2012). Eyes as windows to the soul: Gazing behavior is related to personality. *Journal of Research in Personality, 46*(2), 147-156. doi:https://doi.org/10.1016/j.jrp.2011.12.010

Saucier, G. (1994). Mini-Markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of personality assessment, 63*(3), 506-516. doi:https://doi.org/10.1207/s15327752jpa6303_8

Shaw, M. L., & Shaw, P. (1977). Optimal allocation of cognitive resources to spatial locations. *Journal of Experimental Psychology: Human Perception and Performance, 3*(2), 201. doi:https://doi.org/10.1037//0096-1523.3.2.201

Teng, C.-I., Chang, S.-S., & Hsu, K.-H. (2009). Emotional stability of nurses: impact on patient safety. *Journal of Advanced Nursing, 65*(10), 2088-2096. doi:https://doi.org/10.1111/j.1365-2648.2009.05072.x

Umer, W., Yu, Y., & Antwi Afari, M. F. (2022). Quantifying the Effect of Mental Stress on Physical Stress for Construction Tasks. *Journal of Construction Engineering and Management, 148*(3), 04021204.

Waehrer, G. M., Dong, X. S., Miller, T., Haile, E., & Men, Y. (2007). Costs of occupational injuries in construction in the United States. *Accident Analysis & Prevention, 39*(6), 1258-1266. doi:https://doi.org/10.1016/j.aap.2007.03.012

Wickens, C. D. (2002). Situation Awareness and Workload in Aviation. *Current Directions in Psychological Science, 11*(4), 128-133. doi:10.1111/1467-8721.00184

Winkler, M., Perlman, Y., & Westreich, S. (2019). Reporting near-miss safety events: Impacts and decision-making analysis. *Safety Science, 117*, 365-374. doi:https://doi.org/10.1016/j.ssci.2019.04.029

Yuan, X., Li, Y., Xu, Y., & Huang, N. (2018). Curvilinear effects of personality on safety performance: The moderating role of supervisor support. *Personality and Individual Differences, 122*, 55-61. doi:https://doi.org/10.1016/j.paid.2017.10.005