

Neuro-Inclusive Safety Management in Construction: Practitioner Perceptions of Cognitive and Sensory Diversity

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Abstract: Construction health and safety management has traditionally prioritized physical hazards through regulatory compliance, engineering controls and behavioral safety approaches. Limited attention has been paid to how cognitive and sensory diversity interact with hazard recognition, safety communication and decision-making. This study examined practices reported by construction health and safety officers and site managers for supporting neurodivergent workers during routine construction operations. An exploratory qualitative survey was conducted with 13 health and safety officers and eight site managers in Gauteng Province, South Africa. Twenty-one of 38 invited practitioners completed five open-ended questions. Reflexive thematic analysis identified five related findings. Cognitive and sensory demands were recognized informally but rarely incorporated into risk assessments. Multimodal and simplified communication was valued but inconsistently applied. Supervisors received limited formal preparation. Workplace adjustments were mainly informal or proposed rather than embedded within safety systems. Evaluation continued to rely on conventional lagging indicators. These findings identify a system-design gap rather than locating risk within neurodivergent workers. The study contributes a construction-specific pathway linking site conditions, neurocognitive variation, safety processes, response practices and perceived outcomes. As the evidence reflects practitioner perceptions rather than verified diagnoses or measured safety outcomes, causal conclusions are not supported. The study recommends integrating cognitive ergonomics, psychosocial risk management, supervisor development and leading indicators into routine construction safety systems to strengthen hazard recognition, worker wellbeing and organizational learning.

Keywords: Cognitive ergonomics; construction health and safety; hazard recognition; neurodiversity; psychosocial risk management.

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1. Introduction

Construction work combines changing site layouts, multiple contractors, production pressure, mobile plant, work at height and frequent task handovers. These conditions make safety dependent on more than compliance with procedures. Workers must notice weak signals, select relevant information, retain instructions and adapt decisions as conditions change. In South Africa, this challenge is intensified by uneven contractor capability, multilingual workforces, skills shortages and temporary project organizations (Smallwood and Deacon, 2017; Ayesu-Koranteng, 2026). Federated Employers Mutual Assurance Company data reported 300,850 insured construction workers in 2025, an accident rate of 2.17 per 100 workers and a fatality rate of 13.96 per 100,000 workers. These figures are not directly comparable across all national systems, but they underscore the ongoing need to improve how construction safety systems account for human performance.

Established Health and Safety (H&S) management systems address hazards through risk assessment, engineering and administrative controls, induction, toolbox talks, supervision, inspections and incident learning. Human factors research has broadened this model by showing that hazard recognition depends on attention, working memory, perception and decision-making (Liao et al., 2021; Xiang et al., 2023). Psychosocial risk research similarly demonstrates that workload, leadership, communication and work organization influence health and performance (Jain et al., 2021). These perspectives explain fluctuating demands, but they do not, by themselves, account for stable variation in how people process information or regulate sensory input.

Neurodiversity provides that missing inclusion perspective. It describes natural variation in neurocognitive functioning across a population and includes people who may identify as autistic, dyslexic, dyspraxic or as having Attention Deficit Hyperactivity Disorder (ADHD), among other profiles (Dwyer, 2022; McLennan et al., 2025). A neurodiversity perspective does not treat a diagnostic label as a safety hazard. It asks whether work systems create avoidable mismatch between task demands, communication practices, sensory conditions and a worker's way of processing information. This distinction matters because a deficit framing can stigmatize workers, encourage disclosure pressure and divert attention from controllable features of work design.

Research on workplace neurodiversity is expanding, but it remains concentrated in education, healthcare, technology and office settings. Construction evidence is scarce, particularly in emerging economies where informal practices, resource constraints and temporary employment relationships may limit the transfer of corporate inclusion models (Doyle and McDowall, 2022; Maseko et al., 2026). Construction safety studies address cognitive workload, fatigue, distraction and psychosocial strain, yet seldom connect these issues to neurocognitive variation or specify how existing safety-management processes should change. The resulting gap lies between an inclusion discourse focused on acceptance and a safety-management discourse focused on operational control.

This study therefore asks: How do construction H&S officers and site managers perceive the recognition, management and evaluation of cognitive and sensory diversity within site safety systems? The objectives progress from diagnosis to action: (1) Identify how cognitive and sensory risks are perceived during site risk assessment. (2) Examine reported communication, supervision and workplace-adjustment practices. (3) Evaluate how far these practices are formalized and measured within safety-management systems. The contribution is a construction-specific account of the system mechanisms through which neuro-inclusive practice may strengthen communication, participation and hazard recognition, while clearly separating reported practice from proposed improvement.

2. Literature Review

2.1. Conceptual Boundaries

Neurodiversity refers to naturally occurring variation in neurocognitive functioning across a population. The term "neurodivergent" describes individuals whose cognitive processing differs from dominant social expectations, including people associated with autism, Attention Deficit Hyperactivity Disorder, dyslexia and dyspraxia (Dwyer, 2022; McLennan et al., 2025). Neurodiversity is therefore a form of human variation rather than a mental-health condition, a temporary impairment, an occupational hazard or a clinical diagnosis.

Mental health concerns psychological well-being and conditions affecting emotion, mood and behavior (Mason Stephens et al., 2023). Neurodivergence and mental-health difficulties sometimes co-occur, but neither concept defines the other. A neurodivergent person does not necessarily experience poor mental health, while a neurotypical person still experiences mental health difficulties.

Cognitive workload refers to the mental resources required by a task relative to the resources available to the worker. It varies with task complexity and working conditions and affects workers across neurotypes (Liao et al., 2021; Xiang et al., 2023). Fatigue is a temporary reduction in physical or cognitive capacity associated with exertion, insufficient recovery, sleep loss or prolonged work. Sensory stress is a response arising when environmental stimulation, including noise, heat, glare, vibration or crowding, exceeds an individual's regulatory capacity. These concepts describe work demands or temporary responses, whereas neurodiversity describes enduring variation in neurocognitive functioning.

Human factors is a field concerned with interactions among workers, tasks, technologies, environments and organizational systems. Psychosocial risks are occupational hazards arising from work design, workload, leadership, communication, employment arrangements and workplace relationships (Jain et al., 2021; ISO 45003, 2021). The study, therefore, treats neurodiversity as human variation, workload and sensory exposure as demands, fatigue and sensory stress as responses, human factors as an analytical discipline, and psychosocial risk management as an organizational control approach. This distinction prevents fatigue, distress, communication difficulties or unsafe work design from being misclassified as evidence of neurodivergence.

2.2. Construction Safety, Cognition and Psychosocial Conditions

Hazard recognition is a cognitively demanding activity. Workers must search visually, interpret incomplete cues, draw on experience and prioritize competing information. Cognitive overload, distraction and environmental exposure can reduce attention allocation and are associated with unsafe behavior (Kim et al., 2022; Xiang et al., 2023; He et al., 2026). Repetitive safety communication can also lose salience when workers become familiar with routine hazards. These mechanisms help explain why simply increasing the quantity of instructions does not guarantee understanding.

The Job Demand-Control-Support and Job Demands-Resources models locate performance within workload, decision authority, support and organizational resources (Karasek, 1979; Johnson and Hall, 1988; Bakker and Demerouti, 2007). In construction, production pressure, employment insecurity, fragmented responsibility and environmental conditions influence cognitive and emotional functioning (Moshashaei et al., 2026). These conditions also shape whether workers report difficulty without fear of being judged as incapable.

These models explain task and organizational demands, while neurodiversity introduces variation in attention regulation, sensory processing, communication and executive functioning. Chang et al. (2024) found differences in attentional allocation and situational awareness among workers with ADHD during a simulated worker-artificial intelligence bricklaying task. The study supports person-task analysis but does not justify generalizing performance characteristics across neurodivergent workers.

2.3. Neurodiversity in Temporary Construction Organizations

Workplace research associates neurodivergence with varied capabilities and barriers rather than a uniform set of characteristics. Reported capabilities include sustained concentration, pattern recognition, attention to detail and alternative problem solving. Reported barriers include ambiguous communication, sensory overload, inflexible procedures and stigma (Doyle and McDowall, 2022; McLennan et al., 2025; Adigun et al., 2025). Their relevance differs among individuals, tasks and environments. Adjustments should therefore be selected through worker consultation and task assessment rather than on assumptions based on diagnostic labels.

Project-based work introduces additional constraints. Changing teams, subcontracted employment, production targets and shifting work areas reduce continuity in supervision and support (Sherratt and Raiden, 2023). Adigun et al. (2025) found that disclosure, line-manager awareness, structured communication and access to adjustments influenced neurodivergent professionals' experiences in project environments. Construction adjustments also require assessment against operational hazards. Hearing protection intended to reduce sensory exposure might, for example, obstruct alarms, instructions or mobile-plant warnings.

South African evidence remains limited. Maseko et al. (2026) identified low awareness and silent exclusion in construction, while the implementation of site-level controls remains poorly documented. Routine risk assessment, pre-task planning, communication and incident learning therefore provide practical points for integrating neuro-inclusive practices without separating them from established safety controls.

2.4. Integrated Analytical Framework

The framework integrates four perspectives with distinct analytical functions. The neurodiversity paradigm positions neurocognitive variation as a feature of workforce diversity and shifts attention from individual deficit towards person-environment fit (Fung and Doyle, 2021; Dwyer, 2022; McLennan et al., 2025). It also recognizes differences across neurodivergent profiles and intersecting social identities (Calvard et al., 2026). Cognitive ergonomics and human factors explain how attention, memory, sensory processing, task demands and system design influence hazard recognition and safe performance (Liao et al., 2021; Xiang et al., 2023). The Job Demand-Control-Support and Job Demands-Resources models connect these processes to workload, decision authority, supervisory support and organizational resources (Karasek, 1979; Johnson and Hall, 1988; Bakker and Demerouti, 2007). The Neurodivergent Safe Space Framework addresses worker voice, belonging, disclosure and protection from stigma (Scholz et al., 2026).

The integration follows the pathway presented in Fig. 1. Site demands and worker variation interact to shape cognitive, sensory and psychosocial demands. Risk assessment, communication, supervision and work design represent the safety processes through which organizations respond. These responses are classified as formal controls, informal adjustments or proposed interventions. Their perceived outcomes concern understanding, participation, hazard recognition and wellbeing. Incident learning returns information to safety processes for control revision.

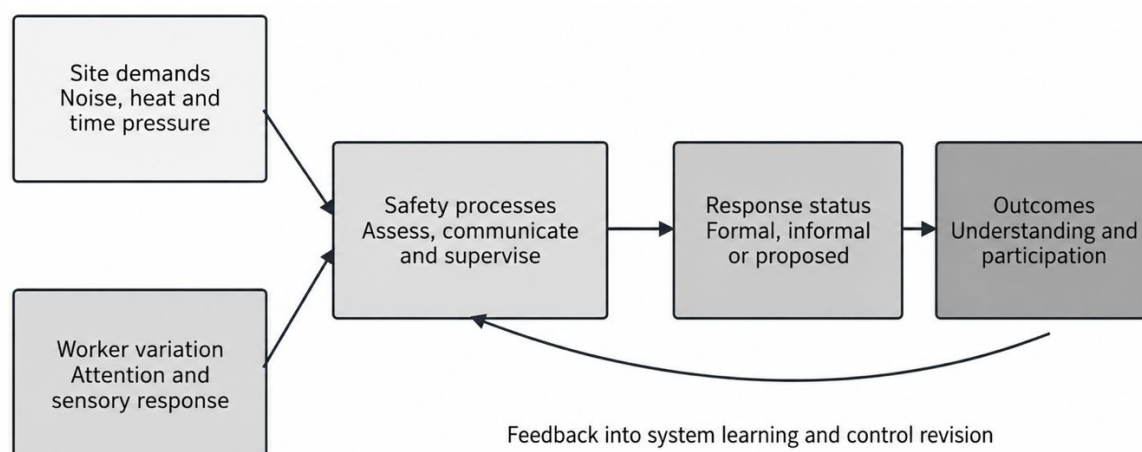


Fig. 1. Neuro-inclusive construction safety management pathway

The framework guides the examination of how construction H&S officers and site managers perceive cognitive and sensory demands, describe organizational responses and evaluate their outcomes. It is an analytical structure rather than a

tested causal model. It therefore locates manageable risk within interactions among workers, tasks, site conditions and organizational systems rather than within neurodivergent identity.

3. Methodology

3.1. Research Design and Scope

The study employed an exploratory qualitative survey design to examine practitioners' perceptions of current and proposed safety management practices for cognitive and sensory diversity in construction. Qualitative surveys support consistent collection of reflective written accounts from geographically dispersed participants and suit underexplored research areas (Jansen, 2010; Braun et al., 2021). The unit of analysis was the practitioner's account of safety practice. The study did not diagnose workers, examine clinical records, estimate the prevalence of neurodivergence, or measure safety outcomes. The design provided contextual breadth across participants but lacked the depth and probing associated with qualitative interviews.

3.2. Participants and Sampling

The study population comprised H&S officers and site managers working on construction projects in Gauteng Province, South Africa. Purposive sampling selected these roles because H&S officers coordinate risk assessment, compliance, training and incident processes, while site managers oversee work sequencing, resources and operational supervision (Smallwood and Deacon, 2017; Osei-Asibey et al., 2021). Their combined perspectives covered the formal administration and site-level implementation of construction safety systems.

Thirty-eight practitioners were invited, and 21 responded, producing a response rate of 55.3% ($21 \div 38 \times 100$). The sample comprised 13 H&S officers and 8 site managers, with 2 to 13 years of experience across residential, commercial, civil and industrial projects. Reported credentials included South African Council for the Project and Construction Management Professions registration, Safety Management Training Course certification, National Examination Board in Occupational Safety and Health qualifications, Hazard Identification and Risk Assessment training and International Organization for Standardization 45001 experience.

The sample supported context-specific understanding rather than statistical generalization, consistent with exploratory qualitative research (Creswell, 2014). Non-response and self-selection created a risk of overrepresenting practitioners interested in inclusion. The occupational focus also excluded the perspectives of workers, subcontractors, trade unions and occupational-health practitioners.

3.3. Instrument and Data Collection

Data were collected through an online qualitative questionnaire developed from literature on neurodiversity, construction safety and occupational health (Fung and Doyle, 2021; Doyle and McDowall, 2022; Scholz et al., 2026). The instrument contained five open-ended questions addressing cognitive and sensory risk assessment, safety communication, supervisor responses, workplace adjustments and evaluation of inclusive safety systems.

The questionnaire was distributed electronically between October 2025 and June 2026. Online administration enabled participants to complete the questions at a suitable time and provide considered written responses while maintaining consistency across the dataset (Braun et al., 2021; Melegati et al., 2024). The available study records do not document a formal pilot test, average response length or verified experience supporting workers with disclosed neurodivergence. Participant statements were therefore interpreted as practitioner perceptions rather than verified accounts of individual neurodivergent workers.

3.4. Data Analysis and Reflexivity

Responses were analyzed through reflexive thematic analysis following Braun and Clarke's six-phase approach (Braun and Clarke, 2006, 2021). The researchers read the responses, generated initial codes, grouped related codes, developed candidate themes, reviewed the themes against the dataset and defined their analytical focus. Coding was inductive, while the research objectives, questionnaire domains and analytical framework provided deductive orientation. The questionnaire domains served as starting points rather than predetermined themes. Codes occurring across different questions were compared and developed into themes representing the progression from risk recognition to system evaluation.

The analysis distinguished among formal practices, informal practices and proposed interventions. Formal practices referred to documented, standardized or organization-wide controls. Informal practices comprised local adjustments reported within routine supervision without evidence of organizational standardization. Proposed interventions referred to recommendations or future practices not verified as implemented. Qualifying accounts were retained, including responses indicating that existing controls addressed general fatigue rather than neurodiversity or that proposed technologies had not been implemented.

Reflexivity involved examining how deficit-based assumptions might influence the interpretation of participant accounts. The analysis, therefore, focused on interactions among workers, tasks and safety systems rather than treating neurodivergence as an inherent risk. Alternative explanations, including fatigue, unclear communication, environmental exposure and resource constraints, were considered during theme development. An audit trail documented coding and theme-development decisions. Credibility was supported through participant quotations and qualifying accounts. Dependability and

confirmability were addressed by maintaining links among extracts, codes, categories and themes, consistent with Lincoln and Guba's (1985) trustworthiness criteria.

Table 2. Analytical pathway from first-order codes to final themes

First-order codes	Analytical category	Final theme
Noise, visual clutter, information overload, changing work areas and masking	Cognitive and sensory demand recognition	Invisible cognitive and sensory risks
Verbal instructions, demonstrations, visual aids and confirmation of understanding	Adaptive safety communication	Communication beyond compliance
Limited training, judgment-based responses, monitoring and stigma	Supervisory capability	Managing cognitive and sensory risks
Task segmentation, structured routines, pauses, environmental controls and flexible supervision	Workplace adjustment	Emerging neuro-inclusive safety practices
Incident rates, audits, participation, psychological safety and evaluation gaps	Performance evidence	Measuring neuro-inclusive safety performance

4. Findings

Five themes linked the recognition of cognitive and sensory demands to the evaluation of organizational responses. Across the dataset, participants described established physical safety processes alongside weaker attention to cognitive and sensory demands. Their accounts included current formal controls, informal adaptations and proposed interventions. Participants' observations reflected practitioner interpretations and did not establish whether individual workers were neurodivergent.

4.1. Invisible Cognitive and Sensory Risks

Participants described routine risk assessment as centered on legislation, inspections, task-specific hazards, personal protective equipment and standard operating procedures. Cognitive or sensory issues were identified through behavior, conversation or visible changes in performance rather than through a defined assessment field. One participant stated: "We are not trained for neuro people. Construction has a culture of following how things used to be done" (P1). Another explained that workers may not disclose difficulty because "anything linked to mental health or disability is seen as weakness" (P2).

Practitioners identified noise, dust, visual clutter, multiple simultaneous instructions, time pressure and sustained concentration as conditions affecting attention and information processing. One participant described workers appearing distracted, overwhelmed or confused under combined demands. Another reported instance in which apparent illness or physical collapse was interpreted as a response to noise, dust or sensory overload. These accounts demonstrated practical awareness but no consistent procedure for distinguishing neurocognitive mismatch from fatigue, illness, psychological distress or unclear instruction.

A counterpoint was that existing hazard controls already addressed some exposures. Noise controls and PPE, for example, can benefit all workers regardless of identity. Participants did not reject these controls. The perceived gap was that existing assessments seldom examined how combined demands affected understanding, attention or participation; and seldom involved the worker in selecting an appropriate response.

4.2. Communication Beyond Compliance

Communication was the most developed area of reported adaptation. Participants described combining verbal instruction with visual aids, demonstrations, written reminders and toolbox talks. Complex activities were broken into shorter stages, and supervisors used questions or demonstrations to confirm understanding. These practices are generally informal or embedded in ordinary supervision rather than labeled as neuro-inclusive programs.

Participants also challenged the assumption that attendance equals comprehension. P7 observed: "Most of them are fidgeting during toolbox briefings. They get bored easily. It doesn't mean they aren't listening, but they've lost focus." P3 noted: "In spite of periodic safety training, workers tend to focus on their work tasks while ignoring hazards they routinely encounter." These responses suggest two mechanisms: long or repetitive briefings may exceed attention resources, and familiarity may reduce the salience of repeated messages.

Participants favored shorter instructions, logical sequencing, practical examples, visual reinforcement and confirmation of understanding. They also recognized that one communication format would not suit every worker. Their accounts supported offering alternative formats while maintaining consistent safety content. However, no participant reported an organization-wide process for selecting, documenting and evaluating communication adjustments and for neurocognitive diversity. Communication adaptation, therefore, remained an informal supervisory practice rather than a formal system control.

4.3. Supervisory Capability and Response

Supervisors were positioned as central to recognizing behavioral changes and to initiating immediate responses. However, participants reported limited formal preparation for neurodiversity. P6 stated, "Formal training on neurodiversity remains limited within our organization." P4 identified a narrow interpretation of the concept, stating, "People always think neuro means the extreme type of autism." These accounts indicated that recognition was shaped by limited knowledge and visible stereotypes, thereby risking the overlooking of less apparent or undisclosed needs. Reported responses included stopping a task, allowing a short reset, simplifying instructions, rotating tasks and providing closer guidance. One participant clarified that such responses were normally used for fatigue or illness rather than neurodiversity. This counterexample shows that existing recovery practices may be transferable, but it would be inaccurate to call them established neuro-inclusive controls.

Participants linked capability to workplace culture. Workers needed a safe means of reporting confusion, overload or sensory difficulty without being labeled weak or incapable. However, safety decisions could not depend on diagnostic disclosure. Participants therefore favored training based on observable changes, confidential consultation and task assessment. This approach maintained the supervisor's safety responsibilities while avoiding informal diagnosis.

4.4. Workplace Adjustments and Control Status

Few participants reported formal neuro-inclusive programs. Informal practices included breaking activities into smaller tasks, providing written work instructions, using predictable sequencing, providing visual reminders, reducing unnecessary interruptions, allocating tasks flexibly and providing additional supervision. P8 described "breaking complex activities into smaller tasks, providing written work instructions and reducing unnecessary distractions". These adjustments target work design and communication rather than diagnostic labels. Participants questioned whether physical controls alone were sufficient. P19 said: "PPEs like goggles and ear protection are provided, but I'm sure that's not enough." The concern was not that PPE lacked value but that it could not resolve unclear instructions, visual clutter or fear of reporting difficulty. Some respondents proposed quiet recovery spaces, wearable alerts, digital reminders, drones and virtual-reality training. These were proposals, not verified current interventions.

Feasibility concerns were implicit throughout the responses. Adjustments must remain compatible with alarms, team communication, production sequencing and the hierarchy of controls. Individualization was therefore preferred to universal assumptions, with the worker consulted and the adjustment reviewed as site conditions change.

4.5. Evaluating Neuro-Inclusive Safety Performance

Current performance measurement is reported to rely on incident rates, near misses, audits, inspections and behavioral observations. These measures provided evidence of compliance and recorded outcomes but offered limited information about whether workers understood instructions, participated in safety processes or received suitable adjustments.

Participants proposed leading indicators addressing communication checks, worker engagement, psychological safety, supervisor competence, adjustment use and learning from reported confusion or overload. P20 questioned where sensory overstimulation would be recorded within systems designed around incidents, equipment failures and near misses. This observation identified a reporting gap between experiences affecting safe performance and events recognized by conventional safety systems. P21 stated, "When people feel understood, they're more engaged, more confident and more likely to perform safely." This statement represented a perceived relationship rather than a measured effect. It identified a proposed pathway linking inclusive communication, worker participation and safe performance. The findings showed that participants recognized the value of broader indicators but did not report established measures for evaluating neuro-inclusive safety practices.

5. Discussion

5.1. From Inclusion to a Safety-Management Mechanism

The findings extend workplace neurodiversity research from a general inclusion concern into the operational processes of construction safety management. The mechanism begins with person-environment fit. Noise, visual clutter, ambiguous instructions, simultaneous demands and changing work conditions place different cognitive and sensory demands on workers. When risk assessments classify these conditions only as physical exposures, their effects on information processing, communication and participation remain overlooked. The resulting difficulty is then interpreted as distraction, non-compliance or poor performance rather than as a possible mismatch between the worker, task and environment. This interpretation aligns with cognitive ergonomics research linking hazard recognition to attention, working memory and the processing of competing information (Liao et al., 2021; Xiang et al., 2023). Chang et al. (2024) similarly identified differences in attentional allocation and situational awareness during a simulated construction task involving workers with ADHD. However, their results pertain to a specific task and neurodivergent profile and should not be generalized to workers or construction activities.

The findings also connect cognitive demands with organizational conditions. The Job Demand-Control-Support and Job Demands-Resources models explain how workload, decision authority, supervisory support and available resources influence responses to work demands (Karasek, 1979; Johnson and Hall, 1988; Bakker and Demerouti, 2007). Stigma and low psychological safety restrict workers' willingness to report confusion, overload or sensory difficulty. The Neurodivergent Safe Space Framework adds voice, belonging and protection from stigma to this mechanism (Scholz et al., 2026). In construction, these principles require adaptation because safe work should not depend on the disclosure of diagnostics. Clear communication, consultation and manageable work design should form part of routine safety practice.

5.2. Alternative Explanations and Contextual Constraints

Observed distraction, confusion or reduced participation does not establish neurodivergence. Fatigue, heat, psychological distress, language differences, literacy, limited experience and poor supervision produce similar behavioral responses. The findings, therefore, support task and system assessment rather than informal diagnosis. This distinction also strengthens the practical relevance of the proposed measures. Clear instructions, the reduction of unnecessary information, confirmation of understanding, and structured work benefit a wider workforce while leaving room for individual adjustments.

Construction site characteristics also influence cognitive and emotional functioning. Environmental conditions, work practices, welfare facilities, physical layouts and perceived control operate as demands or resources depending on their quality and consistency (Moshashaei et al., 2026). The findings extend this evidence by showing how practitioners connect these conditions with communication, supervision and risk assessment. Neurodiversity adds heterogeneity to this relationship because workers differ in attention regulation, sensory processing and communication preferences. South African project conditions further shape implementation. Temporary employment, layered subcontracting, production pressure and unequal organizational resources reduce continuity in supervision and access to specialist support. Smaller contractors are unlikely to sustain separate neurodiversity programs. Integration into existing risk assessments, pre-task planning, toolbox talks, supervision and incident learning therefore offers a more feasible route. This approach responds to the low awareness and silent exclusion identified in South African construction research (Maseko et al., 2026).

5.3. Theoretical Contribution

The study contributes a construction-specific integration of neurodiversity and safety-management perspectives. The neurodiversity paradigm positions cognitive variation at the population and person-environment levels rather than locating risk within individual identity (Dwyer, 2022; McLennan et al., 2025). Cognitive ergonomics explains how task and environmental demands affect information processing and hazard recognition. The Job Demand-Control-Support and Job Demands-Resources models explain how workload, control, support and organizational resources shape those demands. The Neurodivergent Safe Space Framework explains why worker voice, belonging and non-stigmatizing consultation influence the reporting of difficulties. The resulting framework distinguishes concepts often treated as equivalent. Neurodiversity represents human variation. Cognitive workload and sensory exposure represent work demands. Fatigue and sensory stress represent temporary responses. Human factors provides a discipline for analyzing worker-system interaction. Psychosocial risks arise from work design and organizational conditions. These distinctions clarify responsibility by directing intervention towards tasks, environments and management systems.

Fig. 1 extends these perspectives through a feedback pathway linking site demands and worker variation with safety processes, response status and perceived outcomes. Its contribution lies in distinguishing formal controls from informal adjustments and proposed interventions. This distinction exposes where organizational learning breaks down. Informal responses are difficult to evaluate when not documented, and proposed technologies should not be interpreted as implemented practice. The framework remains analytical and requires empirical testing before causal relationships are inferred.

5.4. Practical Contribution

The practical contribution is a structured pathway for embedding neuro-inclusive considerations within established safety systems. Risk assessments should examine combined cognitive and sensory demands alongside physical hazards. Worker consultation should inform the selection of controls without requiring disclosure of diagnostic information. Safety communication should use concise sequencing, demonstrations, visual support and confirmation of understanding while preserving safety-critical content. Supervisor development should focus on recognizing changes in performance, initiating confidential conversations and assessing tasks without diagnosing workers. Agreed adjustments should be documented, checked against existing hazards and reviewed as site conditions change. This process aligns neuro-inclusive practice with the hierarchy of controls and management-of-change procedures.

Evaluation should combine conventional indicators, including incidents, near misses and audits, with leading indicators. Relevant measures include confirmation of understanding, supervisor competence, worker participation, use and review of adjustments, psychological safety and learning from reported overload or confusion. Organizations should also distinguish formal controls, informal practices and proposed interventions when assessing implementation. This classification identifies where existing practices require standardization and where proposed measures require piloting and evaluation.

5.5. Ethical and Implementation Risks

Neuro-inclusive safety practice presents ethical risks when support depends on disclosure or assumptions about behavior. Requests for diagnostic information risk compromising privacy and exposing workers to discrimination. Behavioral interpretation also risks stereotyping workers whose difficulties arise from fatigue, stress, language or work design. Visible adjustments might unintentionally reveal personal information to colleagues. Organizations should use voluntary and confidential consultation, collect only information required for task and safety decisions, and separate support from diagnostic judgment. Workers should participate in selecting and reviewing adjustments. These principles align with evidence showing that disclosure decisions depend on organizational culture, trust and access to support (Adigun et al., 2025; Volpone and Hennekam, 2026).

Adjustments also require assessment for unintended safety consequences. Hearing protection might obstruct alarms or mobile-plant warnings. Reduced interruptions might affect team coordination. Task rotation might assign work beyond a worker's competence. Quiet recovery areas might create supervision or emergency-response concerns. Each adjustment should therefore undergo task-specific risk assessment, implementation monitoring and periodic review. Neuro-inclusive practice should maintain competence requirements while modifying avoidable barriers within the work system.

6. Conclusion

This study examined how construction H&S officers and site managers perceive the recognition, management and evaluation of cognitive and sensory diversity within site safety systems. Participants recognized noise, visual clutter, competing instructions, time pressure and sustained concentration as relevant demands. However, these demands were identified primarily through behavioral observation rather than formal risk assessment procedures. The first proposition is that cognitive and sensory demands remain weakly integrated into construction risk assessment despite practitioner awareness of their relevance. Participants also reported multimodal communication, task segmentation, written instructions, structured routines and closer supervision. These practices were mainly informal, reactive or proposed rather than documented organizational controls. The second proposition is that neuro-inclusive safety currently depends more on individual supervisory judgment than on standardized management processes. Evaluation remained centered on incidents, near misses, audits and behavioral observations. Measures addressing comprehension, worker participation, psychological safety, adjustment use and supervisory competence were absent. The third proposition is that conventional safety indicators provide insufficient evidence for evaluating neuro-inclusive practice.

Construction organizations should incorporate cognitive and sensory prompts into risk assessments, provide supervisors with neurodiversity and communication training, document task-based adjustments and introduce leading indicators alongside conventional safety measures. These actions should be implemented through confidential worker consultation and reviewed against safety-critical requirements. The study, therefore, positions neuro-inclusive safety as an extension of existing risk management rather than a separate program or an attribution of risk to neurodivergent workers.

7. Limitations and Future Research

The study has six limitations. First, it represents practitioner perceptions rather than direct accounts from neurodivergent construction workers. Recruitment of neurodivergent workers was constrained by reluctance to disclose a neurodivergent identity within an industry where disclosure is associated with stigma and employment concerns. Direct interviews would also require heightened ethical safeguards regarding voluntary disclosure, confidentiality, psychological distress and the risk that the research may be perceived as a clinical assessment. Second, some practitioners had supported neurodivergent workers but were uncomfortable providing detailed accounts because the situations were intense, sensitive and private. The study, therefore, excluded information that might have identified workers or disclosed confidential workplace experiences. Third, the written questionnaire prevented probing, clarification and deeper exploration of brief or contradictory responses. Fourth, the purposive sample comprised 21 practitioners from Gauteng, limiting transferability across provinces, project types and organizational contexts. Self-selection also risked overrepresenting practitioners interested in inclusion. Fifth, incomplete role attribution for some responses restricted detailed comparison between H&S officers and site managers. Sixth, site observations, organizational records and safety-performance data were unavailable for corroboration because company incident and performance information is confidential and not accessible.

Future research should prioritize studies co-designed with neurodivergent construction workers and include supervisors, subcontractors, trade unions and occupational-health practitioners. Studies should compare trades, safety-critical tasks, project stages, contractor grades and site conditions to determine where cognitive and sensory demands occur. Interviews should be combined with site observations, task-risk assessments, toolbox talks and safety documentation to establish how formal controls and informal adjustments operate during construction activities. Intervention studies should evaluate cognitive and sensory prompts in risk assessments, multimodal toolbox talks, structured work instructions, supervisor training and adjustment registers. Research partnerships with construction companies are required to access confidential incident, near-miss and performance data under controlled ethical agreements. Longitudinal studies should assess whether these interventions are associated with improved instruction comprehension, hazard recognition, worker participation, reporting of overload and safety performance across project phases. Comparative research across South African provinces and contractor sizes would strengthen the transferability of the findings.

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Author Contributions

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Appendix A. Qualitative Questionnaire

Safety Management Practices for Neurodivergent Workers in Construction Sites

1. How do you currently identify and assess cognitive and sensory risks for neurodivergent workers during site risk assessments?
2. What specific communication strategies do you use to ensure safety instructions are clearly understood by workers who process information differently?
3. How are supervisors trained to recognize and respond to signs of cognitive overload, distraction or sensory stress on site?
4. What workplace adjustments, such as task structuring, environmental controls or assistive tools, have been implemented to support neurodivergent workers while maintaining safety performance?
5. How do you evaluate whether your safety systems are inclusive, and what strategies do you use to measure their effectiveness for neurodivergent workers?