

EXAMINING ATTITUDES AND PERCEPTIONS TOWARDS WAREHOUSE SAFETY BEHAVIOUR

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ABSTRACT

Purpose: Workplace accidents can have severe consequences ranging from the loss of life, permanent disability, legal liabilities, and work stoppages. Workers' attitudes and perceptions are key to preventing workplace accidents. This study examined how the attitudes and perceptions of warehouse personnel in Singapore affect their intention to practice safety at work.

Design/methodology/approach: The study applied the Theory of Planned Behaviour (TPB) as the framework to model safety behaviour in warehouses. The TPB model's constructs – attitudes, subjective norms, and perceived behavioural control – were measured using a set of survey items. To test the model framework against real data, data was collected in two phases: (1) pilot (or elicitation) survey and (2) main survey. Data was collected through a combination of qualitative and quantitative methods, including online and in-person interviews.

Findings: The TPB model accounted for 62% of the variability in workers' intention to practice safety in the warehouse. Attitudes and subjective norms on practising safety significantly influenced the intention to practice safety, while perceived behavioural control did not. Workers from different cultural backgrounds may respond differently to safety practice and social norms.

Research limitations: Future research should expand the sample size and recruit workers from different countries to study cross-national differences and assess the generalisability of the findings.

Practical implications: Internationally, most organisations are cognisant of the importance of Workplace Safety and Health (WSH). This has led to the provision of adequate training and resources for WSH; broadly, workers have the resources to work safely. Our findings indicate that to further enhance WSH performance, organisations need to focus on worker attitudes and subjective norms as well as understand cultural differences.

Originality/value: Few studies have applied the TPB framework to study safety behaviour in the logistics sector in Singapore. Even fewer have focused specifically on warehouse safety behaviour. Our findings highlight the significance of attitudinal and normative factors over perceived control in shaping safety intentions, providing valuable insights for WSH improvements in warehouses internationally.

Keywords: Workplace Safety and Health, Warehouse Sector, Theory of Planned Behaviour, Attitudes, Perceptions

Introduction

Singapore serves as the regional or global headquarters for 25 of the world's largest logistics players (EDB, 2024) and is ranked by the World Bank (2024) among the top 10 global logistics hubs over 2007-2023. In 2023, the Transportation and Storage sector contributed to 6.8% of Singapore's GDP and employed 9.1% of the resident workforce (Singapore Department of Statistics, 2024). Despite its economic importance, the sector poses significant workplace safety challenges.

The Transportation and Storage sector is one of three high-risk sectors that have contributed to the share of total workplace fatal (second highest) and major (third highest) injuries in Singapore. According to the Workplace Safety and Health Report 2023 (Ministry of Manpower, 2023):

- Of the 36 fatal injuries in 2023, the Construction sector was the highest contributor accounting for 18 fatal injuries (50.0%), followed by Transportation and Storage with 8 (22.2%), and Manufacturing with 5 (13.9%).
- Of the 590 major injuries in 2023, the top contributing sector was Manufacturing with 150 major injuries (25.4%), followed closely by Construction with 149 (25.3%), and Transportation and Storage with 47 (8.0%).

The warehouse environment poses significant safety and health risks (Workplace Safety and Health Advisory Committee, 2008). Handling of goods (e.g. lifting, pushing or pulling) carried out repetitively

and over a prolonged period can cause musculoskeletal injuries. Retrieving and putting away goods on high storage racks can expose workers to hazards such as “falls from height” and “struck by falling object”. Working with forklifts and conveyor systems can expose workers to hazards such as “struck by moving object” and “caught in between objects”.

While logistics is crucial to Singapore's economy, few studies have explored workplace safety from the perspective of warehouse workers. This study examines how attitudes and perceptions of warehouse workers affect their intention to practice safety at work. Two research questions were developed to guide this study:

RQ1: What behavioural model can be applied to explain safety behaviour in warehouses?

RQ2: What factors affect can safety behaviour in the warehouse setting?

Literature Review

This literature review examines several approaches to understanding workplace safety behaviour, their main findings, limitations, and the gaps in knowledge that remain.

Health Belief Model

The Health Belief Model (HBM) is a psychological framework to investigate why people take or do not take preventive health actions (Rosenstock, 1966). The HBM has the following constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and cues to action. Ndep et al. (2020) applied HBM to explore factors influencing safety practices among workers in medium and large-sized factories in Nigeria. They found high levels of perceived susceptibility (95%) to workplace injuries, perceived severity (94%) to injuries, and awareness (98%) that such injuries were preventable. Yet, there was low self-efficacy (22%) in the use of personal protective equipment, indicating a disconnect between perceptions and actual safety practice.

The limitation of the HBM is that it focuses on individual perceptions and overlooks the role of social norms and peer influences as well as workplace culture that may affect safety behaviour. Ndep et al. (2020) focused on factory workers and did not explore how the HBM can apply to the warehouse setting where different safety risks and behaviour may be present.

Safety Climate and Safety Behaviour

Griffin and Neal (2000) developed a framework that linked safety climate (i.e. how safety culture is perceived by employees at a given moment) to safety performance (i.e. actual behaviour that workers perform at work) in several manufacturing and mining organisations in Australia. The study found that safety climate had a direct impact on safety behaviour. Using structural equation modelling (SEM), they found that positive safety climate led to higher safety compliance (i.e. adhering to safety rules) and increased safety participation (i.e. engagement in voluntary safety activities). The framework highlighted that workers' knowledge, skill, and motivation mediated the relationship between safety climate and behaviour.

However, Griffin and Neal (2000) did not delve into how safety climate impacts safety behaviour in warehouse environments. In addition, the framework focused on organisational factors such as policies and practices, with less attention given to individual attitudes and social norms, which may play a role in shaping safety behaviour in the workplace.

Leadership and Safety

de Vries et al. (2016) investigated the factors that contributed to a safer warehouse environment among warehouse employees and managers in small, medium-sized and large warehouses across 11 industries in The Netherlands. The study found that safety-specific transformational leadership (SSTL) played an important role in reducing warehouse accidents. Managers with a prevention-focused mindset positively related to SSTL as a leadership style. SSTL positively affected safety outcomes without negatively affecting productivity or quality, suggesting that focusing on safety did not compromise other performance metrics.

de Vries et al. (2016) reported some limitations of their study. As the study used cross-sectional data, there was a possibility that previous managers' policies influenced current accident rates, limiting the ability to establish causality between SSTL and safety outcomes. Only a small number of warehouses participated in the study which may affect the generalisation of the findings. The non-response bias

may have skewed the results towards safer warehouses; unsafe warehouses with poor safety records were less likely to participate.

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB; Arjen, 1991, 2006) is a widely used psychological framework for understanding and predicting human behaviour. TPB posits that whether a person intends to do something depends on how positively or negatively the person feels about doing it (“*attitudes*”), how much social pressure the person feels to do it (“*subjective norms*”), and whether the person feels in control over the situation (“*perceived behavioural control*”). See Figure 1. Several studies have applied the TPB to explain safety behaviour in various contexts.

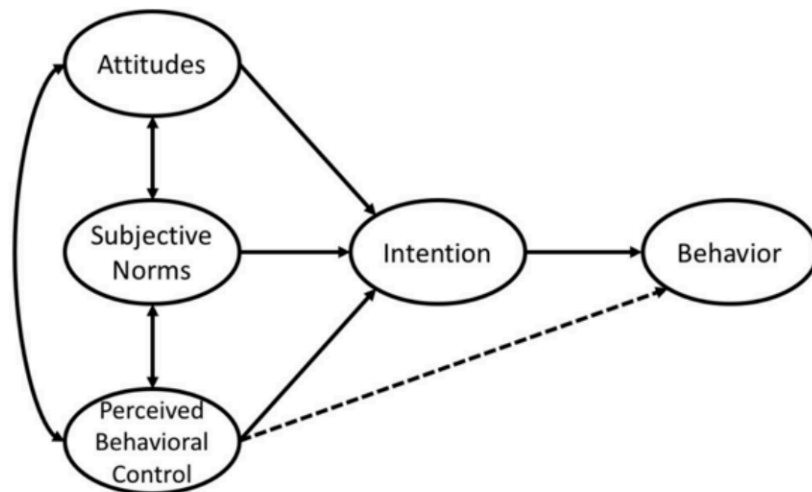


Figure 1: Theory of Planned Behaviour (Source: Ajzen, 1991)

For instance, Fogarty and Shaw (2010) applied the TPB to investigate safety violations of aircraft maintenance personnel in the Australian Defence Force. They found that attitudes, group norms, and intentions accounted for about 50% of the variance in self-reported violations. They noted the importance of management attitudes and group norms in shaping behaviour.

More recently, Cheng et al (2021) applied the TPB to study traffic violation behaviour of e-bike couriers in China. Their results showed that attitudes, descriptive norms, and perceived behavioural control explained about 56% of the variance in intention to engage in traffic violation behaviour. They also noted that intentions together with perceived behavioural control accounted for about 29% of the variance in self-reported violation behaviour.

Previous research has contributed to the understanding of safety behaviour in various settings by applying frameworks such as the Health Belief Model (HBM), safety climate, and safety-specific transformational leadership. However, these studies have mainly focused on individual, managerial or organisational factors. Few studies have explored safety behaviour in warehouses, especially considering social and peer influences. While the TPB has been effective in other contexts, its use in warehouse environments remains limited.

This study addresses this gap by applying the TPB to examine the behavioural factors influencing safety intentions in warehouses. The findings can offer organisations valuable insights into key areas for improving workplace safety and health.

Methodology

This study used the Theory of Planned Behaviour (TPB) as the theoretical framework to explore safety intentions among warehouse workers. Both qualitative and quantitative data were collected to test the TPB model. Data collection occurred in two phases: (1) a pilot survey; followed by (2) a main survey.

Phase 1: Pilot Survey

The pilot (or elicitation) survey sought to identify the salient beliefs that warehouse workers hold towards practising safety in the warehouse. This survey used a semi-structured, qualitative approach centred around the three constructs of the TPB: (1) attitudes, (2) subjective norms, and (3) perceived behavioural control. Respondents were asked open-ended questions related to the perceived advantages, disadvantages, social approval, and barriers to practising safety in the warehouse.

The pilot survey was conducted in March 2023 using Google Forms through online and in-person interviews. The call to participate online was sent out to personal contacts in the logistics sector via social media to reach out to warehouse workers. In-person interviews were carried out near an industrial estate in a conversational format to elicit workers' views on safety behaviour. Each interview took about 10 to 15 minutes to complete.

A total of 15 warehouse workers responded, of which 10 responded online and 5 in-person. The most frequently cited responses to the open-ended questions were analysed to develop the structured questions for the main survey.

Phase 2: Main Survey

The main survey for warehouse workers used a structured approach to collect mainly quantitative data. The survey questionnaire consisted of two sections:

Section 1: Respondent information (7 questions)

Section 2: Attitudes and perceptions on safety behaviour (total 17 questions)

- Attitudes on practising safety (5 questions)
- Subjective norms on practising safety (4 questions)
- Perceived behavioural control on practising safety (5 questions)
- Intention to practise safety (3 questions)

The attitude and perception questions were constructed in plain, easy-to-understand English and used a 7-point Likert scale, ranging from 1 ("strongly agree") to 7 ("strongly disagree") to measure responses to the TPB constructs. The survey questionnaire was administered using Google Forms and the order of questions was randomised.

The main survey was conducted in April and July 2023. In-person interviews were carried out by visiting areas where many warehouse workers congregate during weekends for social gatherings and during weekday evenings at the end of their shift. The interviewer asked the questions in an unobtrusive and relaxed manner, entered the inputs on the participants' behalf, and ensured no questions were skipped or left unanswered.

A total of 121 warehouse workers participated in the surveys. Each survey took about 15 minutes to complete. Most migrant workers from India required clarification in their native language.

Results and Discussion

To enhance the quality of data, respondents who gave uniform, non-differentiating responses (i.e. flatlining) for items on attitudes and perceptions were excluded from the analysis as they were not likely to be meaningfully engaged with the survey or rushed through it. As a result of the exclusion criteria, ten responses were removed: 9 respondents rated "1" for every item (i.e. socially desirable answer); 1 respondent rated "4" (i.e. neutral) for every item.

Respondent Profiles

Figure 2 shows the profiles of the warehouse workers analysed (N = 111) after the exclusion criteria was applied. Most respondents (70.3%) indicated they had at least 5 years of work experience, with a mean of 5.8 years. Most respondents reported they worked between 40 to 50 hours per week. The vast majority (88.3%) indicated they worked in warehouses with a size of between 10 to 50 workers.

The most common age group of respondents was 25-30 years old, followed by those aged 30-35 and 35-40 years old. The mean age of respondents was 34.0 years old. Two-thirds of the warehouse workers surveyed were male while one-third were female. With regards to nationality, most

respondents (44.1%) indicated they came from India, followed by Singapore (27.9%), Malaysia (25.2%) and Bangladesh (2.7%).

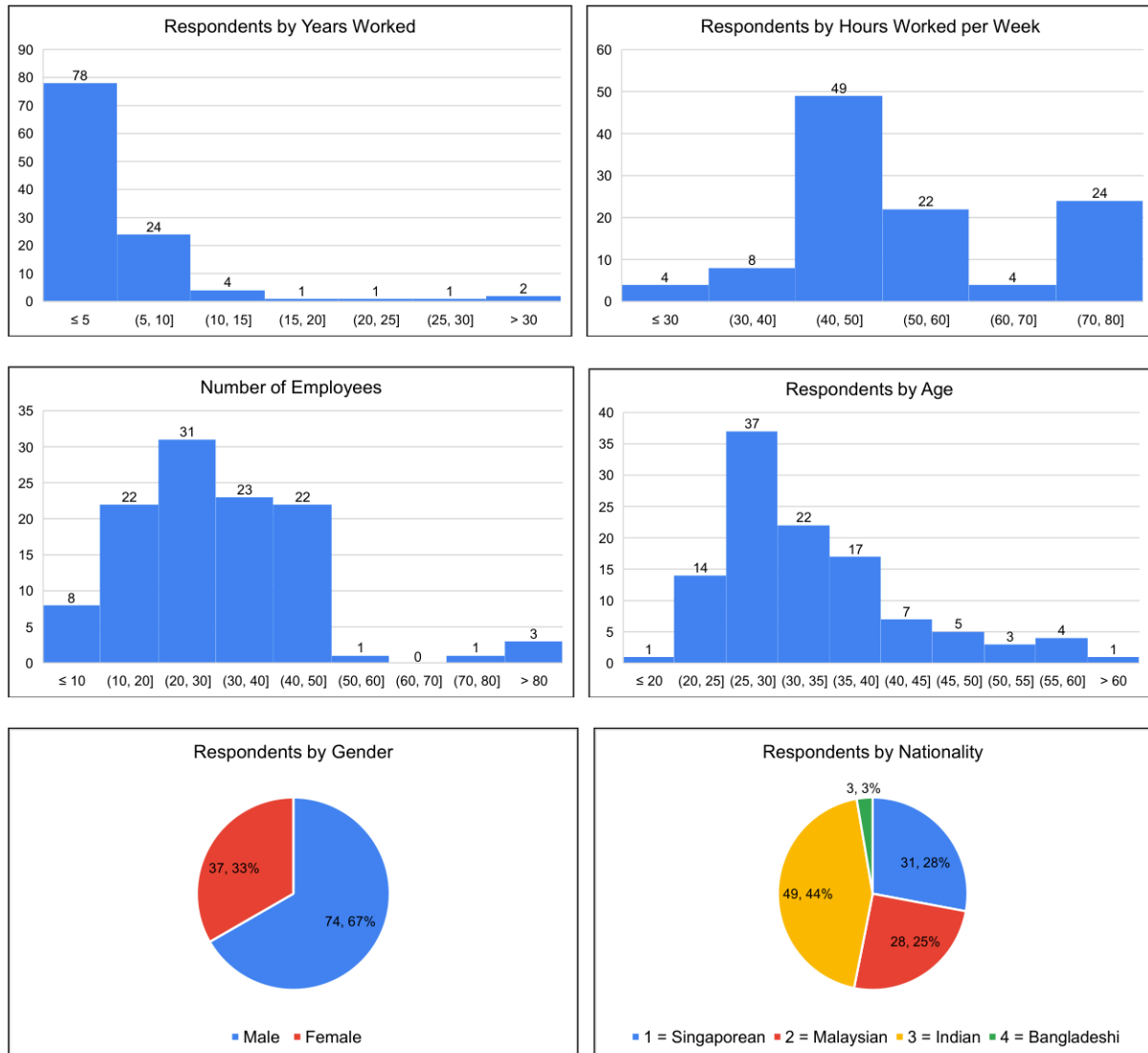


Figure 2: Respondent profiles

Ratings on Attitudes and Perceptions

Table 1 summarises the means and standard deviations of ratings for the TPB items measured in the main survey. For attitudes represented by ATT1-ATT5, respondents agreed that practising safety in the warehouse would result in a safer workplace (mean score = 1.47), better health (1.62) and good staff morale (1.74). Interestingly, respondents were closer to neutral when it came to time (3.53) and convenience (3.02).

Regarding subjective norms (SN1-SN4), respondents strongly agreed that family/spouse (1.29) played an important role in influencing their intention to practise safety in the warehouse, followed by their supervisor (1.94) and colleagues (1.95). Respondents agreed that knowing their colleagues were likely to practise safety (2.51) would influence their intention to practise safety.

For perceived behavioural control (PBC1-PBC5), respondents agreed they had the safety culture (2.01), safety training (2.29), safety equipment (2.33), and proper signs and floor markings (2.41) to practise safety. Respondents somewhat agreed that they had sufficient time to practise safety (3.15).

Regarding intention (INT1-INT3), respondents strongly agreed that they expected to (1.33), will practice (1.34) and intended to practice (1.35) safety in the warehouse.

Constructs	Items	Content	Mean	SD
Attitudes	ATT1	Practising safety in the warehouse would result in a safer workplace.	1.47	0.63
	ATT2	Practising safety in the warehouse would result in better health.	1.62	0.89
	ATT3	Practising safety in the warehouse would be good for staff morale.	1.74	0.92
	ATT4	Practising safety in the warehouse does not take up too much time.	3.53	1.70
	ATT5	Practising safety in the warehouse is convenient.	3.02	1.55
Subjective Norms	SN1	My supervisor thinks that I should practise safety in the warehouse.	1.94	1.01
	SN2	My family/spouse think that I should practise safety in the warehouse.	1.29	0.94
	SN3	My colleagues think that I should practise safety in the warehouse.	1.95	1.09
	SN4	My colleagues are likely to practise safety in the warehouse.	2.51	1.23
Perceived Behavioural Control	PBC1	I have the safety equipment needed to practise safety in the warehouse.	2.33	0.99
	PBC2	I have the necessary safety training needed to practise safety in the warehouse.	2.29	1.12
	PBC3	My warehouse has the proper signs and floor markings needed for me to practise safety.	2.41	1.01
	PBC4	I have the time needed to practise safety in the warehouse.	3.15	1.40
	PBC5	The safety culture at my warehouse makes it easy for me to practice safety.	2.01	0.90
Intention	INT1	I expect to practise safety when working in the warehouse.	1.33	0.65
	INT2	I will practise safety when working in the warehouse.	1.34	0.78
	INT3	I intend to practise safety when working in the warehouse.	1.35	0.79

*Note on 7-point Likert scale: 1 = Strongly Agree, 2 = Agree, 3 = Somewhat Agree, 4 = Neutral, 5 = Somewhat Disagree, 6 = Disagree, 7 = Strongly Disagree

Table 1: Mean and standard deviation of Likert ratings for each item

For the full set of TPB items, Cronbach's alpha ranged from 0.563 to 0.863, indicating the items gave responses with reasonable to high levels of reliability. We tested the removal of items within each construct to see if Cronbach's alpha could be improved. The optimal set of items that gave the best Cronbach's alpha was removal of ATT4 and ATT5 in the attitudes construct (value increased from 0.563 to 0.775); keeping all items in the subjective norms construct (0.568); removal of PBC4 in the perceived behavioural control construct (value increased from 0.740 to 0.773); and keeping all items in the intention construct (0.863). The ratings for each item within the TPB constructs were then averaged to develop the composite ratings for further analysis.

Model Evaluation and Factors Affecting Safety Behaviour

Table 2 presents the results of multiple linear regression analysis to evaluate the goodness-of-fit of the TPB model. Intention to practice safety was set as the dependent variable, while attitudes, subjective norms and perceived behavioural control were the independent variables. For all workers surveyed, the adjusted R² indicated that the TPB model accounted for about 62% of the variability in data, which is considered a good fit. The model performed well for Singaporean workers (84%) but performed rather poorly for Malaysian (24%) and India/Bangladeshi workers (20%). There may be other factors at play not captured by the TPB model, e.g. cultural, language, and socio-economic factors.

Both attitudes and subjective norms were significant predictors (at the 5% level) of safety intention for all workers in the sample. Attitudes and subjective norms were also strong predictors for Singaporean workers. Subjective norms was the only significant predictor for Malaysian workers, while attitudes was the only significant predictor for Indian and Bangladeshi workers. Perceived behavioural control was not significant for all workers and across all groups.

Nationality	Singapore	Malaysia	India & Bangladesh	All Workers
Dependent Variable: Intention <i>"I expect / will / intend to practice safety when working in the warehouse"</i>				
Independent Variables	Regression Coefficients			
Attitudes <i>"Practising safety would result in safer workplace; better health; would be good for staff morale"</i>	0.567*	0.157	0.273*	0.426*
Subjective Norms <i>"My supervisor / family / spouse / colleagues think that I should practice safety"</i> <i>"My colleagues are likely to practice safety"</i>	0.534*	0.528*	0.137	0.514*
Perceived Behavioural Control <i>"I have the safety equipment / safety training needed to practice safety"</i> <i>"My warehouse has proper signs and floor markings"</i> <i>"Safety culture at my warehouse makes it easy"</i>	-0.125	-0.148	-0.021	-0.106
N	31	27	51	111
Adjusted R ²	0.843	0.238	0.200	0.618

Note: * $p < 0.05$, i.e. regression coefficient is statistically significant at 5% level

Table 2: Evaluation of the TPB model for warehouse safety behaviour

Implications

Importance of attitudes and social norms. Our results indicate that workers' positive attitudes toward safety and influence of subjective norms (e.g. expectations from supervisor, family and peers) had a strong positive effect on their intention to practice safety in the warehouse. Across all groups, perceived behavioural control was consistently not significant. We can only surmise that workers may feel they have adequate safety resources and safety culture at the workplace to work safely.

This suggests that efforts to enhance workplace safety should focus on reinforcing positive attitudes and leveraging social norms within the workplace. These initiatives should help workers see safety as valuable, beneficial, and integral to their work. Initiatives to strengthen positive attitudes toward safety can include safety awareness campaigns, safety training programmes, rewards and recognition programmes, and integrating safety into job evaluations. Initiatives to leverage social norms can include peer-led safety leaders, team-based safety challenges, safety pledges, and management and supervisor role modelling.

Importance of understanding cultural differences. Our findings suggest that workers from different cultural backgrounds may respond differently to safety practices and social norms. For instance, Singaporean workers may be more accustomed to local safety practices and compliance culture, where attitudes and subjective norms are key drivers of behaviour. Malaysian workers may depend more on collective or group norms, arising from a more community-oriented culture where peer and supervisor expectations are highly influential. Indian and Bangladeshi workers may come from environments with different safety standards that prioritise personal beliefs and attitudes on safety over workplace norms that they may find unfamiliar.

These differences suggest that interventions targeted at improving warehouse safety may need to be tailored to the cultural and demographic context of the workforce. By tailoring such interventions, organisations can foster a more inclusive workplace where safety becomes a shared priority across diverse cultural groups. Examples of culturally sensitive interventions can include culturally tailored safety training, customised communication of safety norms, tailored safety recognition programmes, culturally sensitive safety ambassadors, and multicultural safety awareness events.

Conclusions

This study builds upon previous research by applying the Theory of Planned Behaviour (TPB) to investigate safety behaviour of warehouse workers in Singapore. The combination of qualitative responses from the pilot survey and quantitative data from the main survey provided the basis for

understanding the factors influencing safety intentions. The results revealed that both attitudes and subjective norms on practising safety significantly affected workers' safety intentions, while perceived behavioural control did not have a significant impact. The study also highlighted important cultural differences in how workers from various backgrounds respond to safety practices.

Several limitations need to be noted in this study. First, the small sample size may limit the generalisability of the findings. Broader representation across different nationalities can provide a more nuanced understanding of safety behaviour in warehouses. Second, some respondents may have provided socially acceptable answers rather than honest ones, despite efforts to randomise the order of questions and conduct in-person interviews. Third, the TPB model, while effective in explaining safety intentions for local workers, performed poorly for foreign workers. This suggests that there may be other unmeasured factors – such as cultural, linguistic, or economic conditions – that play a role in influencing safety behaviour.

Future research can address these limitations by expanding the sample size and to include workers from other parts of Asia. Examining the impact of age, gender, and years of work experience on safety intentions may be worthwhile. Given the cultural differences between local and foreign workers, further work should explore how cultural factors affect safety norms and compliance. Developing tailored interventions that consider the specific cultural or social contexts of these groups may lead to more effective strategies for enhancing workplace safety in multinational environments.

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