

# Kruskal-Wallis Test for the Identification of Factors that Influence the Perception of Accidents in Workers in the Construction Sector

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## Abstract

The perception of accident risk in workers in the construction sector was evaluated. A questionnaire was carried out to identify the factors that most influence the perception of risk of accidents. The results show that women are more likely to perceive high occupational risk, workers who intervene little in case of an occupational accident and who present little knowledge of the subject, present a higher perception of occupational risk.

**Keywords:** Accident, Kruskal-Wallis Test, Occupational Hazard.

## INTRODUCTION

Globally there are documented experiences of disasters and calamities where workers have been killed and disabled by various factors, both by hazardous substances and by other mechanisms that have left many lessons learned and shared concerns around the world for risk control and Mitigate them [1]. Because it is a sector marked by informality and basic administrative failures, it is understood that a sector such as construction perceived risk has not been sufficiently evaluated, in view of this is possible to understand absences in the indicators for the relevance of studies related to risks [2].

Consistent with the above, construction work in the UK has the highest accident rates, with the most fatal accidents, and increased time lost in the United Kingdom [3]. Several experimental studies have shown that the use of substances that alter judgment and concentration can cause cognitive and psychomotor alterations that alter work performance and trigger serious situations that risk the workers to suffer injuries and even death [4,5].

Safety risks in the context of industrial safety in the construction area are evaluated by three types of consequences: recoverable injuries, permanent injury and death due to different activities there are other risks such as falling stairs, scaffolding, ceilings, fall of objects, hit by moving elements, contact by moving parts and others, having as main affected the operators of excavators, loaders,

compaction equipment, excavation workers and construction auxiliaries [6].

While the perceptions of workers may be affected by the performance of their work, more so by the ignorance of concepts such as hygiene and ergonomics, because only in the context of daily work pays more attention to risks that can materialize Immediately as incidents or accidents at work [7]. Subjective risk has significant significance in several scales taking social variables, acceptance and influence on the individual, where the interpretation of whether the possibility of materialization of industrial accident risk is real [8]. Human error is still considered by several authors as the main cause of occupational accidents, taking as an essential variable to underestimate the risk and negative effects of stress and pessimism [9].

The trends of workers to engage in unsafe acts and situations are related to demographic aspects such as work experience, educational level and safety experiences, as well as psychological features such as optimism, control of risks and habits [10]. Focusing on the responsibility of the management to achieve the quality and the achievement of goals with criteria and aptitudes for the security, also frames the design and satisfaction towards the achievement of the customer's loyalty, which allows the resolution of problems [11].

Management and experience can indirectly influence levels of risk recognition, validation studies follow-up with construction workers has revealed that the most common reasons leading to unrecognized risks are among others selective attention or inattention to certain types Of threats, to disregard - to ignore the potential danger and the low perception that certain dangers that influence the safety of the labor of the work [12]. Workers with religious beliefs tend to have a more positive perception of the security climate than those without such beliefs [13].

While workers employed by subcontractors tend to have a more positive perception of the safety climate than those employed directly by the main contractor, crucial factors affecting the climate of safety [14]. Which in turn will allow professionals to create a positive safety culture to improve

performance in construction projects [15]. With the management of labor risks, strategies can be identified to control the list of emerging hazards. There is a need to provide training for all managers and employees in the identification and management of risks in different sectors of the economy [16]. Safe working methods are important for safety, especially for tasks that are out of the ordinary, because they achieve social interaction in practice [17].

It is necessary to identify and resolve the gaps between these methods, the practice and demands of the task to be carried out in the construction, seeking safer workplaces [18]. The risk perception has within its priorities the definition of risk, the norms of protection, the responsibility and planning to act in the face of the incident and to be prepared before this [19]. Findings reveal that critical aspects for safety in construction projects face the needs of safety and health at work where to recognize risks within the different processes, noting that architects and engineers perceive a greater probability of accident, while contractors and professionals of security perceive similar conditions of the environment, for that reason designers and managers have improved their knowledge of risk in construction [20]. While workers have responded to questionnaires that risk training is not sufficient, being prone to accidents due to falls from height, making it necessary to do better training in the field, modifying individual behavior among workers [21].

In other contexts the perceived risk analysis of construction workers in Spain, Peru and Nicaragua, where workers are aware that the risks they face at work may have negative consequences in the future, are more likely to have a high Perception of the overall risk of their work. Proving to be important in the contextualization of perceived risk, being contrary to the previous schemes where it was traditionally more relevant the immediacy of the effects of a possible accident [22]. In related studies, there have been significant differences between workers in the residential and industrial sectors [23]. Where the perception of most employees of a company did not feel comfortable to be observed in their jobs, while heavy civilian industry workers felt even more agree than residential workers about being uncomfortable to be observed [24].

**METHODS**

Kind of investigation: The type of study performed is exploratory and inferential.

Population and Sample: The data correspond to 166 employees of construction companies, who were willing to provide the information and to which they were guaranteed reliability.

Collection of information: A questionnaire was applied to the workers considered in the study to identify the factors that most influence the perception of risk of accidents.

Statistical analysis: The non-parametric Kruskal-Wallis test is performed to identify the factors that influence the perception of occupational risk. The comparison of the groups is performed by this test, since the data did not meet the assumptions of the analysis of variance.

Hypothesis tests were performed in the Centurion XV Statgraphics program and a significance level of 0.05 was considered.

**RESULTS AND DISCUSSION**

Table 1 shows the descriptive statistics of workers' perception of risk.

**Table 1:** Descriptive statistics for the perception of occupational risk

|         |        |
|---------|--------|
| Half    | 70,78  |
| Median  | 80     |
| Fashion | 100    |
| Minimum | 5      |
| Maximum | 100    |
| CV      | 40,55% |

It is noted that the scores are skewed to the right (Average <Medium <Fashion), which indicates that most of the perceptual scores are high, that is consistent with the fact that the most frequent qualification is 100 (Fashion). It is observed that the levels of perception oscillate between 5 and 100 points, which produces a high variation (CV = 49.55%). Once the behavior of perception is shown, the Kruskal-Wallis test is performed, where the variables that were significant in the perception of occupational risk were observed.

**Table 2:** Kruskal-Wallis test for perception of occupational risk

| Variable  | P-Value   | Variable  | P-Value    |
|---|-----------|---|------------|
| Gender  | 0,017385* | Possibility of damage based on risk   | 0,116146   |
| Age   | 0,787948  | Severity of damage in case of risk accident   | 0,041175*  |
| Level of Education                                  | 0,599899  | Degree in which you can avoid a risk accident   | 0,011182*  |
| Own knowledge                                       | 0,04254*  | Degree of intervention in case of risk accident   | 0,001159** |
| Knowledge of those responsible                      | 0,116146  | Degree in which a risk accident can affect massively                                      | 0,008096** |
| Fear of damage in accident due to occupational risk | 0,17908   | Circumstances in which the most harmful consequences are experienced in case of exposure. | 0,1428     |

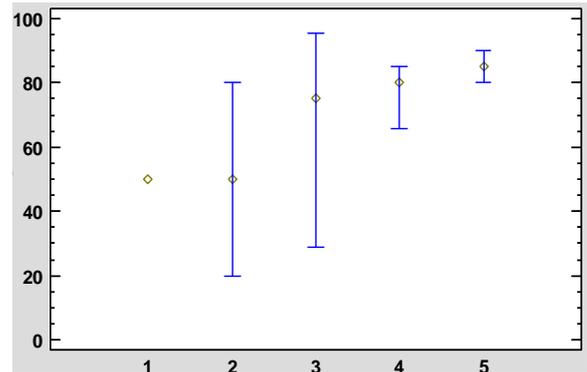
\*Significant difference \*\*Highly significant difference

Table 2 shows the results of the p-value for the kruskal-Wallis hypothesis test, which tests the hypothesis that the medians of the k groups are statistically equal, versus an alternative hypothesis that indicates that there are at least two groups for which the medians present a significant difference, as shown below:

$$H_0: \mu_{\theta_1} = \mu_{\theta_2} = \dots = \mu_{\theta_k} \text{ vs } H_1: \mu_{\theta_i} \neq \mu_{\theta_j} \text{ for some } i \neq j$$

It is observed that the degree of intervention in the event of an accident and the degree to which an accident can affect massively have a highly significant effect on labor risk (P-value <0.01), which indicates that the behavior of these factors strongly influence In the perception of occupational risk that workers have, we next observe the graphs of the medians of the groups for the factors with effect on the labor risk, to observe the categories that influence the increase of the perception of risk. management lies in the innovative activity regulation and management. The innovation policy seems to be a core – a key unit in the development of the strategies of the enterprise at all levels of functional units. The financial strategy is one of the key components in the development of a comprehensive innovation strategy of the enterprise.

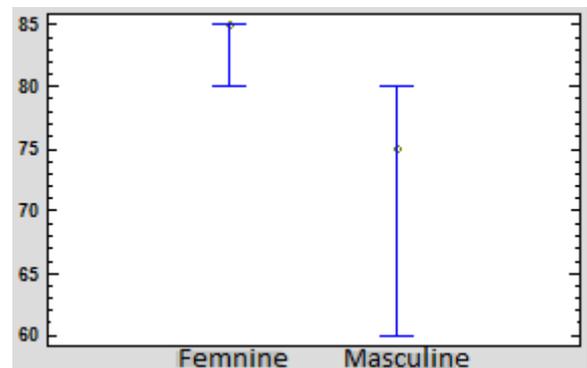
For the degree of intervention presented by the employees (a), it is observed that the options 4 and 5 are those that present in median the highest results, which indicates that the lower the degree of intervention of the employees in case of Risk, the higher the level of risk perception they handle. For the degree to which an accident can affect massively (b), option 5 is the one that maximizes the median of occupational risk, in addition an inverse relationship is observed, that is to say that as the perception of degree of massive accident increases, decreases The perception of occupational risk.



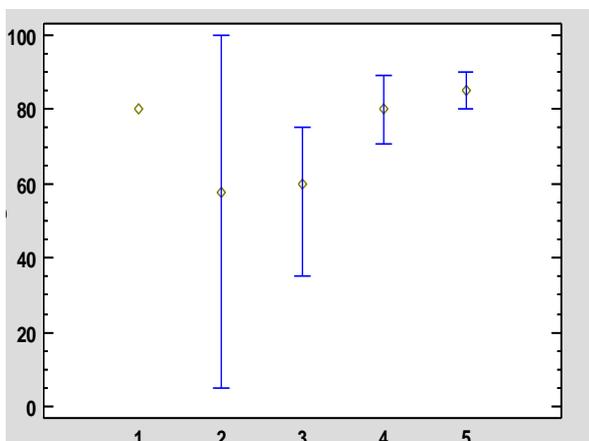
b. Degree in which an accident can affect massively

**Figure 1:** Median chart for highly significant factors in occupational risk

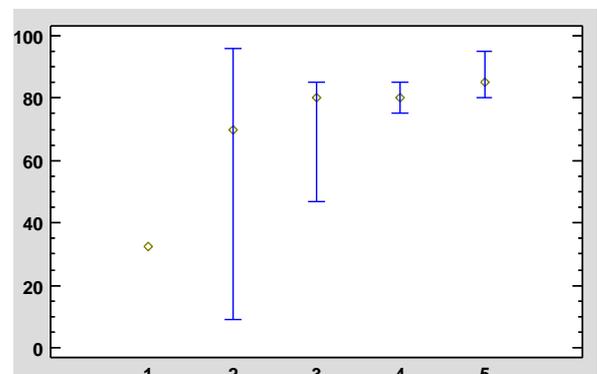
The factors Gender, own knowledge, fear of damages due to work accidents, severity of damage in case of accident due to risk and degree to which the worker can intervene in case of a risk accident are factors that significantly influence The perception of occupational risk (P-value <0.1), the graphs of medians of the factors are observed to identify the levels of those that increase the perception of occupational risk in construction workers.



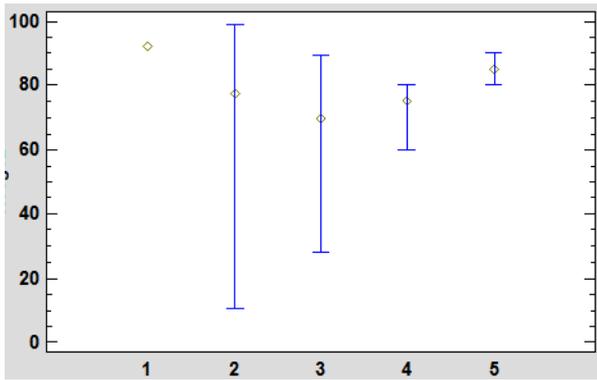
a. Gender



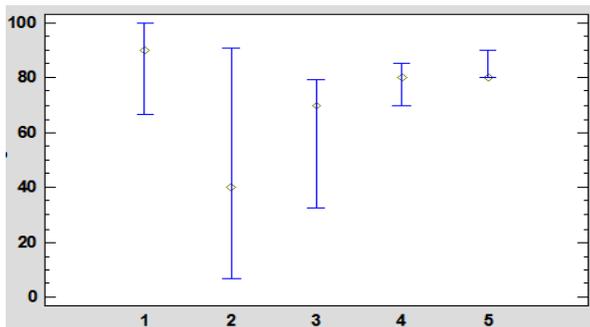
a. Degree of intervention in case of accident



b. Own knowledge



c. Severity of damage in case of accident



d. Degree in which you can avoid an accident by risk

**Figure 2:** Graph of medians by the factors of perception

With respect to the medians, it is observed that women show a higher risk perception than men (a); For knowledge about risk, an inverse relationship is observed (b), since, as knowledge about risk increases, perception of risk decreases; This indicates that trained personnel are less fearful of risk because they know how to act in certain cases. In item c, of Figure 2, it is observed that those employees who perceive high degree in the damage caused by risk, also show a high perception of risk; This indicates that the workers who perceive the risks, are more afraid of the consequences of the accidents caused by them. According to Figure 2.d, the median highest risk corresponds to the group of employees who indicated that they have a high degree of avoidance of an occupational accident; Thus, the employees who can exercise control over possible accidents are the ones who show a greater perception of risk.

## CONCLUSION

In general, workers have a perception of high occupational risk, according to the descriptive measures. According to the factors that were significant with the perception of occupational risk, we have that women present a higher perception of risk than men; The less knowledge a worker has about work risk, the greater the perceived risk they manifest. Workers who perceive high severity of damage by accident

and who can largely avoid an accident due to occupational risk, present a higher perception of risk. Workers who intervene little in case of an occupational accident and who consider that a work accident can affect little massively, have a greater perception of risk.

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