

original article

The effectiveness of “theory of planned behavior” in training the correct principles of manual material handling

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ABSTRACT

Aims: In this study, which was done in Persian Gulf Mining and Metal Industries Special Economic Zone, the efficiency of “theory of planned behavior” in training the correct principles of manual material handling was investigated.

Materials and Methods: To perform this semi-experimental study, based on the theory of planned behavior and method of manual material handling required questionnaires were prepared. After preliminary studies and determining the reliability and validity of questionnaires, the appropriate study population was selected from the workers, and the questionnaires were filled up through interviews.

Results: The results showed that subjective norms (safety factor = 0.51, $P < 0.001$) are the predictors of behavior intention (performing manual material handling correctly) and behavioral control, as well as behavioral intention, are appropriate predictors for behavior change.

Conclusion: This study confirms the efficiency of the theory of planned behavior in modifying the workers’ manual material handling behavior. But since all constructs of the theory of planned behavior could not predict the behavioral intention for correct manual material handling, it can be concluded that for changing the behavioral intention, other theories also should be taken into consideration.

Key words: Manual material handling, perceived behavioral control, subjective norms, theory of planned behavior

INTRODUCTION

Work related accidents have a great impact on workers’ health every year and impose significant costs on employers. It is estimated that 300,000 workers due to 250 million accidents that happen in the workplaces through the world annually.^[1] The cost of such injuries is very high, for example, in Britain total cost of workplace injuries for employers was about 1.2–1.3 million pounds in 2005–2006.^[2] In Britain, during 2001–2002 ergonomic factors accounted for more than

27% of work-related incidents and according to estimations resulted in missing 3.12 million working hours.^[3,4] It has also been introduced as the cause of 36% and 32% of incidents in 2009–2010 and 2010–2011, respectively.^[3,4]

Studies in industrial countries show that unsafe act is the cause of about 90% of work-related incidents and unsafe

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conditions and working environment cause just 10% of these incidents.^[5]

Despite the increasing development of technology, the need to manual material handling in workplaces has not decreased. The manual material handling is one of the most common tasks in industrial settings which includes lifting, lowering, pushing and carrying the loads by hand.^[6]

Back pain is one of the most important injuries caused by manual handling. One of the initial steps, to reduce health effects of manual material handling, is training the correct principles of manual material handling. In fact after training these principles, workers' behavior which is an important predictor of injuries is expected to be modified.^[7-9] There are several factors which have an impact on the process of behavior change and have been investigated by different researches and multiple theories have been presented. One of these theories is "theory of planned behavior." In this regard, Stephen and Hall conducted a study in one of the industries to use the theory of planned behavior for handling materials in a safe manner. The results showed that perceived behavioral control and intention are the strongest predictors of safely material handling. Subjective norms also found to be important but less effective than other factors that have an impact on behavioral intention. The researchers concluded that the theory of planned behavior was a useful model for explaining the behavior in handling the load and many other issues related to safety.^[10] Mohammadi and Heydariniyan investigated the predicting factors of workers' behavior for observing correct posture according to the theory of planned behavior; the results showed that behavioral intention and attitude are the strongest behavior predictors. Subjective norms were not considered as a direct predictor of behavior, but indirectly through other constructs (attitude and perceived behavioral control) had an impact on behavior and intention. The results emphasized on factors such as attitude, perceived behavioral control, subjective norms, and creating a supportive managerial network for encouraging the workers to observe correct postures.^[11]

Since the Bandar Abbas especial economic zone is a place in which manual material handling happens frequently, it is highly needed to effectively train the workers in order to handle the loads correctly and, as a result, avoid musculoskeletal injuries, especially low back pain. Accordingly in this study, which was conducted in Persian Gulf Mining and Metal Industries Special Economic Zone, the correct ways of material handling based on the theory of planned behavior are taught to the workers, and the effectiveness of this theory is evaluated.

MATERIALS AND METHODS

This semi-experimental study was conducted on all 67 participants who were involved in manual material handling

in Bandar Abbas especial economic zone. Data were collected via interview, monitoring, and checklist.

To collect data, at first based on the theory of planned behavior and method of manual material handling some questionnaires were prepared. After preliminary studies and approving the reliability and validity of questionnaires, the appropriate population was selected from the workers of Persian Gulf Mining Industries, and through interviews and monitoring the questionnaires was filled up. After that, the training intervention based on the theory of planned behavior was performed, and the questionnaires were filled up another time. The data taken from the questionnaires were analyzed by SPSS version 19 from IBM company.

RESULTS

The findings, based on multivariable regression, showed that subjective norms are predictors of behavior intention (standard coefficient: 0.51, $P < 0.001$) and perceived behavioral control and behavioral intention are appropriate predictors for behavior change (observing the correct way of manual material handling). In addition, the results supported the theory of planned behavior as a model for explaining behavioral intention and behavior change.

According to Table 1, which shows significance level of coefficients of the regression model for predictors of behavior intention, the coefficient of subjective norms was significant but the coefficients of attitude and behavioral control were not significant. According to Table 2, which shows significance level of coefficients of the regression model for predictors of behavior, the coefficients of behavioral intention and behavioral control as the predictors of behavior were significant. Since the standardized coefficient of behavioral intention is a little more than behavioral control, it has a greater effect on behavior.

DISCUSSION

In general, the results of this study proved the effectiveness of the theory of planned behavior in improving the behavior in the field of manual material handling.

Based on this study, changing the subjective norms leads to changing the behavioral intention, but such trend was not observed for attitude and behavioral control as predictors of behavioral intention.

The results of Linqin study showed that there is a positive significant correlation between subjective norms and the intention for performing correct manual material handling. This positive and significant correlation provides initial facts to support the assumptions of the theory of planned behavior.^[12]

Warner and Eberg reported that perceived behavioral control is a good predictor for changing the manual material handling behavior, which is consistent with the results of our study. The results of Mohammadi *et al.* study showed that training the ergonomics and its principles is useful in changing the working postures. Their study also showed that training, increasing the knowledge and modifying the attitudes provide an appropriate groundwork for accepting ergonomic habits and recommendations.^[13] Our results are also consistent with the results of Paul and echo study which showed that training programs based on the theory of planned behavior was effective on the studied behavior.^[14,15] Rempel *et al.* also showed that training programs which actively contain workers participation are able to mitigate the risk of facing with workers beliefs.^[16,17]

Parallel to our results, Sarvestani *et al.* in their study, about predicting the unsafe intention and behavior, showed that as perceived behavioral control and intention grow higher, the probability of performing safe behaviors will be more, and as a behavioral intention for unsafe behaviors increases, risky behaviors will happen more during working hours.^[18] Ajzen showed that perceived behavioral control is an important and effective factor on behavior. When people are not sure about their ability in performing particular behaviors, measuring perceived behavioral control can help predicting these behaviors. Consistent with our conclusion, his findings emphasized on applying behavioral theories and models to improve safe behaviors.^[2]

Based on this study, behavioral intention and behavioral control were significant predictors of behavioral change,

and behavioral intention was more effective than behavioral control in changing behavior. Since all constructs of the theory of planned behavior were not predictors of behavioral intention, it cannot be used as a comprehensive model for predicting the intention of safe behaviors in manual material handling. According to this model, subjective norms were the most important predictors of safe behaviors intention. Accordingly, it can be concluded that if the family, office boss, and colleagues ask workers for respecting correct ways of manual material handling, the workers will show more safe behaviors.

According to the results and definition of perceived behavioral control, the more a person can control the weight of the load, workplace condition, equipment, and facilities, the better he/she can handle the load. It can also be concluded that by increasing the tendency and motivation of a person for performing correct manual material handling, the behavior of manual material handling will be improved. Based on the results, the behavioral intention was a stronger predictor for behavior change than perceived behavioral control. Therefore, it is possible to increase the tendency of a person for performing correct manual material handling by training programs.

In general, the results of this study proved the importance of social cognitive theories such as the theory of planned behavior to design training programs which are intended to modify the intention for healthy behaviors. According to the results of this study, applying the theory of planned behavior seems effective for changing behavioral intention and modifying the behavior of manual material handling, but since all constructs of this theory were not predictors of behavioral change, it is suggested to investigate the results of other theories such as theory of stages of changing the behavior and theory of health belief, too. According to the complicated nature of health behaviors, there is no comprehensive model or theory which can describe or predict all aspects of behavioral change on its own. In other words, since none of the present models can be comprehensive on their own, they should be used together in order to modify health-related behaviors effectively.

Table 1: Coefficients of regression model for predictors of behavior intention

Variable	T-criterion	Standardized coefficient	Not standardized coefficients		P
			SD	Coefficient	
Model constant	-1.32	-	1.91	-2.51	0.19
Attitude	1.95	0.212	0.06	0.116	0.057
Subjective norms	3.5	0.517	0.16	0.552	0.001
Behavioral control	1.62	0.213	0.08	0.14	0.11

SD: Standard deviation

Table 2: Coefficients of regression model for predictors of behavior

Variable	T-criterion	Standardized coefficient	Not standardized coefficients		P
			SD	Coefficient	
Model constant	4.79	-	12.8	61.36	<0.001
Behavioral intention	3.27	0.443	0.98	3.21	0.002
Behavioral control	3.192	0.438	0.69	2.21	0.003

SD: Standard deviation

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Conflicts of interest

There are no conflicts of interest.

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