Original Article

Effectiveness of Educational Physical Activity Intervention for Preventive of Musculoskeletal Disorders in Bus Drivers

Safiyeh Ghasemi[1], **Asiyeh Pirzadeh**[1,2]

[1]Department of Environmental Manangment, Najafabad Branch, Islamic Azad University, Najafabad, Iran, [2]Department of Health Education and Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Driving is a challenging job. Drivers always face the high risk of musculoskeletal disorders (MSDs). Educational interventions could be effective in preventing and controlling these disorders. The present study aims to assess the effectiveness of an educational physical activity intervention in preventing MSDs among bus drivers in Isfahan, Iran. **Methods:** This quasi-experimental study was conducted on 60 urban bus drivers, who were selected using multistage sampling. They were evaluated at two time points, namely before and three months after the intervention. The intervention was conducted in three 90-minute sessions. The HBM-based educational content was delivered through lectures, PowerPoint presentations, videos, practical demonstrations of corrective exercises, and educational pamphlets. Data were analysed using the SPSS program, version 20, the paired *t*-test, and the independent *t*-test. **Results:** Before the intervention, there was no significant difference between the two groups with respect to the mean scores of the HBM constructs. However, later on, the mean scores of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and behaviour increased significantly in the intervention group, compared with those in the control group. ($P < 0.001$). **Conclusions:** The results showed that the physical activity as an HBM-based educational intervention had a positive effect on the prevention of MSDs in urban bus drivers.

Keywords: *Exercise, health education, musculoskeletal diseases*

Introduction

A bus is one of the most fundamental modes of public transportation. When the health of bus drivers is maintained, their optimal performance is ensured. Indeed, exposure to occupational hazards endangers their health. Definitely, driving as an occupation has its own difficulties. Inactivity, poor posture, prolonged sitting, vibrations transferred from the vehicle-road interface, and repetitive bending or twisting motions during driving cause musculoskeletal disorders (MSDs) in drivers in the long run.[1]

MSDs have high prevalence in different groups of people and represent one of the major causes of occupational injury and disability in industrialised and developed countries.[2-4] They are very common among public transportation drivers. A large number of studies indicate that the prevalence of MSDs in drivers is high.[5-8] Low back pain (LBP) is one of the most common disorders and many studies have revealed its high prevalence among drivers.[9] Prevalence of LBP among drivers was reported between 51-57% in other countries. According to a study in Iran, there exists a considerable prevalence of MSDs among intercity bus drivers.[10]

All people whose occupation is driving have experienced a disorder and pain in different parts of their body; however, the effects on the Musculoskeletal system depending driving hours and working conditions.[11] MSDs could hinder drivers' performance, force their retirement, and lead to the turnover of experienced drivers due to lack of treatment services, thereby imposing huge costs on the society.[12]

There are various corrective and ergonomic interventions to prevent MSDs. Educational interventions which promote physical activity in employees are among the most efficient interventions. Many studies have indicated their effectiveness.[12-16] A study was conducted to evaluate the efficacy of physical exercises with an ergonomic approach in reducing back pain. It reported that an routine exercise with an emphasis

How to cite this article: Ghasemi S, Pirzadeh A. Effectiveness of educational physical activity intervention for preventive of musculoskeletal disorders in bus drivers. Int J Prev Med 2019;10:132.

Address for correspondence:
Dr. Asiyeh Pirzadeh, Department of Health Education and Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, IR Iran.
E-mail: as_pirzadeh@hlth.mui.ac.ir

Access this article online
Website: www.ijpvmjournal.net/www.ijpm.ir
DOI: 10.4103/ijpvm.IJPVM_339_18
Quick Response Code:

on ergonomics could reduce MSDs.[17] In another study, Hasanvand *et al.* demonstrated that corrective exercises reduced pain and MSDs in workers.[18] Other studies have also highlighted the effectiveness of physical exercises in treating MSDs in the neck, the shoulders, and the upper extremities.[19,20]

As shown above, the role of physical activity in reducing and preventing MSDs is prominent. Hence, the researchers of the present study decided to design an educational intervention to prevent these disorders in drivers. Since health education based on models underline the effectiveness of education, the researchers utilized one of the most popular models used to identify and change behaviour to prevent diseases.

The health belief model (HBM) was used in this intervention. Its constructs include perceived susceptibility (the subjective perception of one's vulnerability to a disease), perceived severity (one's belief in the seriousness of the disease), perceived benefits (one's belief in the benefits of engaging in a health-promoting behaviour), perceived barriers (the subjective evaluation of obstacles to the healthy behaviour), self-efficacy (the belief in one's ability to execute the healthy behaviour), and cues to action (stimuli required to trigger the decision-making process to adopt the healthy behaviour).[21] Many studies have employed the HBM to identify and change behaviour and have emphasised its effectiveness.[22-25]

Given the role of physical activity in reducing one's risk of MSDs, the researchers conducted this study to assess the effectiveness of an educational physical activity intervention in preventing MSDs among bus drivers in Isfahan, Iran.

Methods

This is a controlled pre-post intervention and quasi-experimental study. The population consisted of 60 urban bus drivers from Khomeini Shahr in 2017. They were included in the study using multistage sampling method.

In order to take account of ethical considerations, necessary permits were first acquired from the university and the Khomeini Shahr Bus Company. Next, the drivers were briefed on the objectives of the study. Finally, written informed consent was obtained from them before the study began. The researchers assured the drivers that their information would remain confidential and they could opt out of the study at any time.

The inclusion criteria were being willing to participate in the study, having at least one year of driving experience, being a full-time bus driver, suffering from no health problem affecting the research process, and having no history of lower-back or knee surgery or relevant health problems. Ultimately, 60 drivers entered the study. They were randomly assigned to two groups, namely control (n = 30) and intervention (n = 30).

The questionnaire was prepared after consulting the previous studies, reliable sources, the research by Sharafkhani *et al.*,[22] and professionals in health education and promotion, occupational medicine, and occupational health. It was submitted to a panel of experts to determine its validity. The validity of the constructs was confirmed. The reliability of each construct was above 0.75.

The questionnaire consisted of demographic characteristics and HBM-related items including perceived susceptibility (9 questions), perceived severity (11 questions), perceived benefits (16 questions), perceived barriers (10 questions), cues to action (10 questions), and self-efficacy (8 questions). Each section was scored using a five-point Likert scale. The last section in the questionnaire comprised 35 questions about drivers' performance, that is to say, adopting appropriate behaviours to prevent MSDs. This section was scored using a four- point Likert scale. In the end, the data were aligned according to 100.

The Nordic musculoskeletal questionnaire (NMQ) was applied in this research. However, NMQ has 40 forced-choice items identifying areas of the body causing musculoskeletal problems. Completion of this research is aided by a body map to indicate nine symptom sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet. The respondents are asked if they have had any musculoskeletal trouble in the last 7 days which has prevented normal activity. Its validity and reliability have been proven.[26]

The drivers in the two groups completed the questionnaire as a self-report at two time points, namely before the intervention and three months after the intervention.

The educational intervention was carried out in three sessions. It was based on the HBM constructs. The first session focused on perceived susceptibility, perceived severity, and perceived benefits to familiarise the drivers with MSDs, their risk factors such as physical inactivity, and ways to prevent the disorders. Moreover, drivers suffering from MSDs were asked to attend the session and speak with the subjects about their own health problems and their complications. The session lasted for about 45 minutes. The educational content of the first session was delivered through a slideshow presentation, group discussions, and question-and-answer interactions.

The second session focused on perceived barriers and cues to actions. The drivers were familiarised with barriers to proper physical activity and ways to remove them. They were provided with short educational videos and asked to watch them while taking a rest. In order to adopt preventive behaviours, the drivers were introduced to information sources, including educational pamphlets, a health professional, a doctor, and drivers with MSDs. Furthermore, posters depicting useful tailor-made physical exercises were asked to be put up at bus stands.

Additionally, they were provided with a phone number to keep in touch with the researchers and seek counsel from them whenever necessary. The educational content of this session was delivered through a presentation and group discussions. At the end of the session, the drivers were provided with the posters and educational pamphlets.

The third session focused on self-efficacy and performance. It aimed to make the drivers familiar with all stages of physical activity, and help them do exercises in the classroom correctly and step by step under the supervision of a physiotherapist. When they did the exercises well, they received a verbal reward. The session lasted 120 minutes. The educational content was delivered through a presentation, videos, and the practical demonstration of exercises.

The data were collected from the two groups at the two time points. They were – entered in the SPSS -, version 20. In order to analyse the data, descriptive and analytic statistics and a paired *t*-test for comparing mean within group (before and after intervention) and an independent t-test for comparison mean between groups (intervention and control) were used. The significance level was set at 0.05.

Results

The subjects in the intervention group were in the age range of 32-63 and the subjects in the control group were in the age range of 31-56. There was no significant difference was observed between the control and intervention groups with respect to the mean age ($P = 0.15$). No significant difference was found between the groups with respect to work experience, the length of the rest time at work, and the BMI.

The independent *t*-test indicated that there was no significant difference between the two groups with regard to the mean score of knowledge not only before the educational intervention ($P = 0.187$) but also three months after it ($P = 0.734$). Knowledge in this study refers to the subjects' knowledge of performing physical activity efficiently so as to prevent MSDs.

The paired *t*-test showed that there was a significant difference between the pre-intervention and post-intervention mean scores of knowledge in the intervention group ($P = -0.001$). However, no significant difference was found in the control group with regard to this ($P = -0.161$).

Furthermore, according to the independent *t*-test, there was no significant difference between the groups before the intervention with respect to the mean scores of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy Nevertheless, three months later, a significant difference was observed between the two groups as regards all these constructs excluding perceived severity ($P < 0.05$).

Moreover, the paired *t*-test demonstrated that, with respect to the optimal of preventive behaviours (physical activities), there was a significant difference in the intervention group between the mean scores of the constructs before and after the intervention ($P < 0.05$).

The results of the present study revealed that, before the educational intervention, there was no significant difference between the two groups with respect to the mean score of behaviour ($P = 0.812$). In addition, three months after the intervention, no significant difference was observed in the control group between the mean scores of behaviour before and after the intervention ($P = 0.865$) but, in the intervention group, the difference was significant ($P = 0.004$) [Table 1].

Before the intervention, external cues to action, respectively from the highest to the lowest rating, included the occupational health professional, the driver with an MSD, and the pamphlet. In the intervention group, the occupational health professional and the educational poster were the most and the least important cues to action, respectively. Nevertheless, three months after the intervention, no change in the rating of the cues to action was observed in the two groups.

Before the intervention, the frequency distribution of pain in different body parts in the intervention group was as follows: 13 (43.3%) with shoulder pain, 11 (36.7%) with LBP, and 7 (23.3%) with knee pain. However, these percentages decreased after the intervention, being statistically significant: 16.7% with shoulder pain, 20% with LBP, and 10% with knee pain. It must be remarked that, according to the Nordic musculoskeletal questionnaire (NMQ), there was no significant difference between the two time points in the control group as regards these body parts.

Discussion

The present study was conducted to examine the effectiveness of an HBM-based educational intervention in preventing MSDs.

In this study, perceived susceptibility referred to the drivers' perception of the risk of MSDs due to physical inactivity. The intervention led to an increase in the mean score of perceived susceptibility in the intervention group after the intervention and the statistical tests showed that the difference was significant, which is consistent with results of other HBM-based studies.[21,25,27] The reason for changes in perceived susceptibility and perceived severity was that the intervention was conducted using effective educational methods such as applying slide shows and animations to demonstrate the seriousness of the problem, holding group discussions, and having question-and-answer sessions.

The educational intervention improved the subjects' perception of the benefits obtained from physical activity, and also reduced the barriers so that the statistical tests

Table 1: The mean scores of knowledge, performance, and the HBM constructs in the two groups before and after the educational intervention

Variables	Time points	Intervention Mean (SD)	Control Mean (SD)	*P**
Knowledge	Before	80.37 (10.93)	85.87 (18.59)	0.187
	After	86.11 (12.32)	87.50 (18.53)	0.735
	*P***	0.001	0.161	
Perceived susceptibility	Before	77.55 (10.26)	78.05 (12.30)	0.865
	After	85.15 (8.60)	80.02 (10.37)	0.041
	*P***	0.002	0.105	
Perceived severity	Before	73.24 (8.81)	76.72 (11.72)	0.241
	After	83.45 (11.02)	80.18 (10.37)	0.199
	*P***	0.001	0.042	
Perceived benefits	Before	77.41 (8.17)	81.19 (13.33)	0.191
	After	87.47 (8.18)	81.50 (13.40)	0.005
	*P***	0.002	0.678	
Perceived barriers	Before	63.70 (9.35)	59.86 (10.60)	0.143
	After	51.96 (7.99)	60.60 (13.94)	0.005
	*P***	0.001	0.753	
Self-efficacy	Before	62.43 (10.67)	62.91 (14.78)	0.885
	After	73.08 (12.13)	63.53 (14.87)	0.009
	*P***	0.251	0.366	
Behaviour (physical activity)	Before	24.82 (22.55)	26.12 (19.49)	0.812
	After	39.36 (26.90)	25.79 (18.07)	0.025
	*P***	0.004	0.865	

**P* for the independent *t*-test, ***P* for the paired t-test

indicated that there was a significant difference between the two groups after the intervention. This result is in line with results of studies by Moazzami *et al.*, and Khalili *et al.*[28,29] One of the effective ways to reduce the barriers was holding group discussions on the identification of barriers to physical activity and the development of solutions for removing the barriers.

The educational intervention also improved the subjects' perception of their competence in performing a given behaviour. To achieve this end, a physiotherapist trained them in a classroom to do appropriate physical exercises. The subjects did the exercises step by step and in small actions and received a verbal reward when they did them correctly. They were also provided with short educational videos dealing with particular exercises so as to review and repeat the movements whenever possible. After the intervention, the mean score of self-efficacy increased from 62.43 in the intervention group to 73.08. This increase was statistically significant. However, no such increase was observed in the control group. This result is consistent with the result of a study by Fongsri *et al.*, who had explored the effectiveness of a self-efficacy promotion programme in preventing chronic LBP in patient.[30]

In the intervention group, the post-intervention mean score of behaviour (physical activity) was significantly higher than the pre-intervention. This result show the effect of the educational intervention on the intervention group, indicating that the subjects in the intervention group could acquire necessary competence in doing physical activity. Training based on the HBM constructs, particularly self-efficacy, the presence of a physiotherapist, corrective exercises for the lower back, neck, and knees, and the practice of physical exercises at different time points made the given behaviour of the drivers effective. HBM-based studies have revealed similar results.[22]

However, studies such as the one by Choobineh *et al.* which did not utilise the model reported that only a small proportion of their study population achieved a good score for corrective actions necessary to lower the prevalence of LBP. These results are inconsistent with the result the current study revealed.[31]

The data derived from the NMQ indicated that the frequency of pain in the shoulders, lower back, and knees in the intervention group decreased significantly after the intervention. This result illustrated the effectiveness of physical activity in reducing MSDs. These results are in line with what Wang *et al.*, Mohammadi Zeidi *et al.*, and Mohseni Bandpey *et al.* reported in their studies.[32-34]

There are a few limitations in this study. Access to a larger sample size was limited and the drivers did not assist the researchers in completing the questionnaire. Hence, it is recommended that further studies on a larger sample size be conducted so that the results could be generalised. Moreover, questionnaires should be shorter. Additionally, it is recommended that future relevant studies implement effective educational methods to show the severity of complications of MSDs and their consequences, including long-term treatment, absenteeism, and dismissal.

Conclusions

The results of the current study showed that the HBM-based educational intervention was effective in preventing MSDs in intercity urban bus drivers because their perception of the risk of MSDs due to physical inactivity enhanced. So did their perception of the seriousness and negative consequences of physical inactivity and MSDs. Furthermore, the drivers gained an in-depth understanding of the positive benefits of doing physical activity. Ultimately, their self-efficacy improved and they showed competence in performing physical activity.

Acknowledgements

This research was based on a Master's thesis completed at Islamic Azad University, Najafabad Branch, in Isfahan.

Financial support and sponsorship

The author(s) received no financial support from research Council With Code: 15021214952020.

Conflicts of interest

There are no conflicts of interest.

Received: 29 Jul 18 **Accepted:** 16 Mar 19
Published: 12 Aug 19

References

1. Durkin J, Harvey A, Hughson R, Callaghan JP. The effects of lumbar massage on muscle fatigue, muscle oxygenation, low back discomfort, and driver performance during prolonged driving. Ergonomics 2006;49:28-44.
2. Smith DR, Sato M, Miyajima T, Mizutani T, Yamagata Z. Musculoskeletal disorders self-reported by female nursing students in central Japan: A complete cross-sectional survey. Int J Nurs Stud 2003;40:725-9.
3. Iqbal Z, Alghadir A. Prevalence of work-related musculoskeletal disorders among physical therapists. Med Pr 2015;66:459-69.
4. Alghadir A, Zafar H, Iqbal ZA. Work-related musculoskeletal disorders among dental professionals in Saudi Arabia. J Phys Ther Sci 2015;27:1107-12.
5. Sadri G. A model of bus drivers' diseases: Risk factors and bus accidents. Iran J Med Sci 2015;27:39-41.
6. Tamrin SBM, Yokoyama K, Jalaludin J, Aziz NA, Jemoin N, Nordin R, *et al*. The association between risk factors and low back pain among commercial vehicle drivers in peninsular Malaysia: A preliminary result. Ind Health 2007;45:268-78.
7. Andrusaitis SF, Oliveira RP, Barros Filho TEP. Study of the prevalence and risk factors for low back pain in truck drivers in the state of São Paulo, Brazil. Clinics (Sao Paulo) 2006;61:503-10.
8. Szeto GP, Lam P. Work-related musculoskeletal disorders in urban bus drivers of Hong Kong. J Occup Rehabil 2007;17:181-98.
9. Prado-Leon LR, Aceves-González C, Avila-Chaurand R. Occupational driving as a risk factor in low back pain: A case-control study in a Mexican population. Work 2008;31:387-96.
10. Arghami S, Kamali K, NasabAlhosseini M. A survey on musculoskeletal pain in suburban bus drivers. J Occup Hyg Eng 2015;2:72-81.
11. Gallais L, Griffin MJ. Low back pain in car drivers: A review of studies published 1975 to 2005. J Sound Vib 2006;298:499-513.
12. Kontogiannis T. Patterns of driver stress and coping strategies in a Greek sample and their relationship to aberrant behaviors and traffic accidents. Accid Anal Prev 2006;38:913-24.
13. Bremander A, Bergman S. Non-pharmacological management of musculoskeletal disease in primary care. Best Pract Res Clin Rheumatol 2008;22:563-77.
14. Hayden JA, Van Tulder MW, Tomlinson G. Systematic review: Strategies for using exercise therapy to improve outcomes in chronic low back pain. Ann Intern Med 2005;142:776-85.
15. Sirvani M, Rahnama N. The effect of eight weeks of corrective exercises on musculoskeletal disorders in female staff of the Isfahan municipality. Occup Med Q J 2017;9:41-53.
16. Barredo RDV, Mahon K. The effects of exercise and rest breaks on musculoskeletal discomfort during computer tasks: An evidence-based perspective. J Phys Ther Sci 2007;19:151-63.
17. Alexandre NMC, de Moraes MAA, Corrêa Filho HR, Jorge SA. Evaluation of a program to reduce back pain in nursing personnel. Rev Saude Publica 2001;35:356-61.
18. Hasanvand B, Karami K, Hashemi S, Ghanei Gheshlagh R, Afshar F, Zahednezhad H. The effect of corrective exercises on musculoskeletal disorders of Khoramabad workers. J Shahrekord Univ Med Sci 2015;17:61-9.
19. Farahpour N, Esfahani M. Postural deviations from chronic low back pain and correction through exercise therapy. Tehran Univ Med J 2007;65:69-77.
20. Rahnama N, Bambaeichi E, Ryasati F. The effect of eight weeks corrective exercise with ergonomic intervention on musculoskeletal disorders among loabiran industry workers. J Isfahan Med Sch 2010;28:316-26.
21. Glanz K, Rimer BK, Viswanath K. Health Behavior and Health Education: Theory, Research, and Practice. San Francisco: John Wiley & Sons; 2008.
22. Sharafkhani N, Khorsandi M, Shamsi M, Ranjbaran M. The effect of an educational intervention program on the adoption of low back pain preventive behaviors in nurses: An application of the health belief model. Global Spine J 2016;6:29-34.
23. Jones SL, Jones PK, Katz J. Compliance for low-back pain patients in the emergency department. A randomized trial. Spine (Phila Pa) 1988;13:553-6.
24. Mirotznik J, Ginzler E, Zagon G, Baptiste A. Using the health belief model to explain clinic appointment-keeping for the management of a chronic disease condition. J Community Health 1998;23:195-210.
25. Pirzadeh A, Mazaheri MA. The effect of education on women's practice based on the health belief model about pap smear test. Int J Prev Med 2012;3:585.
26. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, *et al*. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18:233-7.
27. Didarloo A, Shekhi S, Sorkhabi Z, Sharafkhani N. Effect of theory-centered educational program on prostate cancer preventive behaviors among male teachers: A quasi-experimental study. Iran J Health Educ Health Promot 2016;4:205-16.
28. Moazzami Z, Dehdari T, Taghdisi M, Soltanian A. Readiness to adopting correct posture in operating-room nurses based on transtheoretical model (TTM) in Hamadan city in 2011. Iran J Epidemiol 2013;9:66-74.
29. Khalili S, Shojaiezadeh D, Azam K, Kheirkhah Rahimabad K, Kharghani Moghadam M, Khazir Z. The effectiveness of

education on the health beliefs and practices related to breast cancer screening among women referred to Shahid Behtash Clinic, Lavizan area, Tehran, using health belief model. J Health 2014;5:45-58.

30. Fongsri U, Rawiworrakul T, Kaewboonchoo O, Kolladarungkri T. Effects of a selfefficacy promoting program for low back pain prevention in patient transfer workers, at a university hospital in Bangkok. Asia J Public Health 2011;2:47-53.
31. Choobineh A, Rajaeefard A, Neghab M. Association between perceived demands and musculoskeletal disorders among hospital nurses of Shiraz University of Medical Sciences: A questionnaire survey. Int J Occup Saf Ergon 2006;12:409-16.
32. Wang M-JJ, Chung H-C, Wu H-C. Evaluating the 300 mm wafer-handling task in semiconductor industry. Int J Ind Ergon 2004;34:459-66.
33. Mohammadi Zeidi I, Morshedi H, Mohammadi Zeidi B. Effectiveness of a theory-based educational intervention on modifying body posture of computer users in Iran. J Rafsanjan Univ Med Sci 2012;11:145-58.
34. Fakhri M, Ahmad Shirveni M, Khaliliyan A. A comparative evaluation of an exercise program and ergonomic advices in the treatment of low back pain: A randomised controlled clinical trial in nursing population. J Guilan Univ Med Sci 2007;16:58-66.