



## The Effect of Educational Intervention Based on Perceived Barriers and Benefits on Employees' Physical Activity Levels: A Quasi-experimental Study

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| ARTICLE INFO                                        | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <b>Article Type:</b><br>Review Article              | <p>Physical activity is a key component of a healthy lifestyle and is recommended to improve public health and indirectly reduce the disease burden and healthcare costs. Therefore, interventions are required to encourage adoption and maintenance. Behavior changes models, such as the Health Belief Model (HBM), are recommended for this purpose. This study aimed to examine the effects of an educational intervention based on perceived barriers and benefits on employees' physical activity levels. This quasi-experimental study was conducted on 130 employees of the educational complex of Hamadan University of Medical Sciences. Participants were randomly assigned using block randomization to the intervention (n=65) and control (n=65) groups. The intervention group attended three educational sessions that focused on perceived barriers and benefits. Both groups were assessed before and two months after the intervention. The control group received no intervention and continued their routine activities during the study period. The participants included 56 men and 74 women, with a mean age of <math>39.93 \pm 8.74</math> years. The intervention significantly increased the mean scores of the model's constructs in the intervention group (<math>p &lt; 0.0001</math>), while no significant changes were observed in the control group. Self-efficacy was the strongest predictor of physical activity. In Conclusion the Health Belief Model-based educational intervention effectively enhanced employees' physical activity. Strengthening self-efficacy was found to be a key determinant of physical activity, suggesting that HBM-based programs can serve as an effective strategy to promote healthy behaviors among university staff.</p> <p><b>Keywords:</b> Perceived benefits; Health Belief Model; Perceived barriers; Physical activity</p> |
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### Introduction

Regular physical activity is essential for maintaining human health. Studies indicate that physical inactivity is a

global problem and ranks among the top ten causes of mortality worldwide, accounting for approximately two million deaths annually [1]. Insufficient physical activity doubles the risk of cardiovascular disease, type 2 diabetes, and obesity. Additionally, it increases the risk of breast and

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colorectal cancer, hypertension, lipid disorders, osteoporosis, depression, and anxiety. Regular physical activity not only strengthens the immune system and helps prevent non-communicable diseases, but also provides psychological benefits by reducing anxiety and depression and enhancing self-esteem. Furthermore, physical activity offers economic advantages by lowering healthcare costs, improving productivity and fostering healthier social and physical environments [2]. For instance, Stamatakis et al. reported that increasing physical activity among Canadian employees through workplace programs saved approximately \$513 per employee annually [3].

Despite the simplicity and effectiveness of regular physical activity in maintaining health, a sedentary lifestyle remains prevalent worldwide. Over 60% of adults worldwide do not achieve the recommended levels of physical activity (at least 150 min of moderate-intensity activity per week) [4]. In Iran, 65% of adults are physically inactive, contributing significantly to the prevalence of cardiovascular disease and cancer [5]. The World Health Organization reports that among Iranian adults aged 15–64 years, physical inactivity affects 76.3% of women and 58.8% of men [2]. In a study conducted by Haghi et al. among employees of Hamadan University of Medical Sciences, 65% of the staff did not engage in sufficient physical activity [6].

The recommended physical activity for adults is at least 30 minutes of moderate-intensity exercise daily, five days a week, which can reduce the risk of chronic disease. Office employees and managers are particularly at risk because of the sedentary nature of their work [2]. Prolonged sitting not only limits energy expenditure but also contributes to weight gain and obesity, which are exacerbated by modern sedentary lifestyles and technological advancements [7]. Health education plays a critical role in promoting voluntary health behaviors, rational use of healthcare services, informed decision-making, disease prevention, attitude changes, and behavior modifications. Programs based on scientific health education models empower individuals to take control of their health, social and physical environments, and lifestyle choices [8]. Among these, the Health Belief Model (HBM) is a widely used framework for understanding and predicting health behaviors, particularly disease prevention. According to the HBM, an individual's decision to adopt a health behavior depends on perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action, as well as the influence of demographic, psychological, social, and structural factors. Previous studies have shown that HBM-based education positively affects individuals' physical activity [9].

Considering that one of the Healthy People 2020 objectives is to increase the proportion of adults engaging in regular moderate-to-vigorous physical activity to at least 50%, and given that physical activity promotion is a cost-effective strategy for chronic disease prevention and health improvement, it is essential to explore effective interventions for different population groups to achieve this goal.

Despite extensive research on the benefits of physical activity and the effectiveness of educational interventions grounded in health promotion models, most previous studies, both in Iran and abroad, have focused on specific populations, such as students, older adults, and patients with chronic diseases. Limited attention has been paid to workplace-based interventions targeting university employees who face unique occupational and environmental barriers to regular physical activity. Moreover, existing domestic studies have primarily assessed knowledge and attitudes rather than actual behavioral changes resulting from Health Belief Model (HBM)-based programs. Therefore, there is a research gap regarding the application and effectiveness of HBM-based educational interventions in improving physical activity among university staff, particularly in the Iranian context.

## **Materials and Methods**

This quasi-experimental study employed a pre- and post-test design. The study population consisted of employees of the educational complex at Hamadan University of Medical Sciences, and the sample was selected according to inclusion and exclusion criteria.

The inclusion criteria were as follows: employment at the university's educational complex, no participation in educational courses related to the study topic in the past year, absence of physical or mental health issues in the past month, a minimum of one year of employment, absence of motor impairments or disabilities, and no use of medications affecting physical activity. The exclusion criteria were as follows: failure to complete the questionnaire or missing more than one educational session.

Convenience sampling was used to recruit participants who met the inclusion criteria and did not meet the exclusion criteria of this study. Participants were randomly assigned to the intervention or control group using block randomization. After recruitment, the participants were provided with explanations of the study objectives, procedures, educational content, and duration, and they provided written informed consent. The following questionnaires were

administered to both groups: demographic information, Health Belief Model (HBM) constructs related to physical activity, and the International Physical Activity Questionnaire (IPAQ). Participants were given sufficient time to complete the questionnaires, and the researcher was available to answer questions. Following the pre-test, the intervention group received an educational program. Due to logistical constraints and to improve instruction quality, the intervention group was divided into six subgroups of 11 participants each (three from the School of Nursing and Midwifery and three from the School of Public Health). Each subgroup attended three weekly sessions, each lasting 90 minutes, with a 10-minute break. The control group comprised 33 participants from the School of Dentistry and 33 from the School of Pharmacy.

The educational sessions were structured as follows: Session 1 focused on barriers to physical activity and practical skills to overcome them; Session 2 covered the perceived benefits of physical activity; and Session 3 provided guidance on how to implement physical activity. At the end of the final session, participants in the intervention group received a booklet containing strategies to enhance perceived benefits, overcome perceived barriers, and practical guidelines. The booklet content was reviewed and approved by the faculty members of the School of Nursing and Midwifery. Participants were encouraged to apply health promotion strategies in their daily lives. The control group did not receive any educational intervention during the study period and continued their usual work. To maintain ethical considerations, after data collection and post-test administration, the same educational materials and booklet provided to the intervention group were also made available to the

control group. This ensured that all participants ultimately benefited from the educational content while maintaining the integrity of our experimental design. Two months after the intervention, a post-test was conducted using the same questionnaires to assess the program's effect.

### Data Analysis

Data were analyzed using SPSS version 22. Descriptive statistics included the means and standard deviations for quantitative data and frequencies and percentages for qualitative data. Analytical tests included the chi-square test for associations between categorical variables, paired t-test for comparing pre- and post-intervention data, Wilcoxon test for non-normally distributed paired data, independent t-test for between-group comparisons, and Mann-Whitney U test for non-normally distributed independent data. The Kolmogorov-Smirnov test was used to assess the normality of the data. A significance level of  $p < 0.05$  was considered.

## Results

The participants included 56 men (43.08%) and 74 women (56.92%) with a mean age of  $39.93 \pm 8.74$  years (minimum age 22 years, maximum age 58 years).

Table 1 presents the distribution of qualitative demographics. The statistical analysis showed no significant differences between the two groups in the distribution of qualitative demographic variables. Table 1 shows the comparison of quantitative demographic variables demonstrated no significant differences between the two groups regarding quantitative demographic variables.

Table 1. Comparison of Qualitative Demographic Variables Between Control and Intervention Groups

| Variable       | Type             | Control (%) | Intervention | p    |
|----------------|------------------|-------------|--------------|------|
| Gender         | Male             | 27 (41.5%)  | 29 (44.6%)   | 0.73 |
|                | Female           | 38 (58.5%)  | 36 (55.4%)   |      |
| Education      | Diploma          | 16 (24.6%)  | 18 (27.7%)   | 0.71 |
|                | Associate Degree | 11 (16.9%)  | 10 (15.4%)   |      |
|                | Bachelor         | 18 (27.7%)  | 21 (32.3%)   |      |
|                | Master           | 20 (30.8%)  | 15 (23.1%)   |      |
|                | PhD              | 0.0(00.0%)  | 1 (1.5%)     |      |
| Marital Status | Single           | 12 (18.5%)  | 10 (15.4%)   | 0.52 |
|                | Married          | 52 (80%)    | 54 (83.1%)   |      |
|                | Divorced         | 0.0(00.0%)  | 1 (1.5%)     |      |
|                | Widowed          | 1.0 (1.5%)  | 0.0(00.0%)   |      |
| Income         | < 1 million IRR  | 0.0(00.0%)  | 1.0 (1.5%)   | 0.51 |
|                | 1–2 million IRR  | 29 (44.6%)  | 30 (46.2%)   |      |
|                | >2 million IRR   | 22 (33.8%)  | 25 (38.5%)   |      |
|                | No Response      | 14 (21.5%)  | 9 (13.8%)    |      |

In Table 2, perceived benefits were compared between the control and intervention groups using the Mann-Whitney test, and the Wilcoxon test was used to compare perceived benefits before and after the intervention. Results showed that there was no significant difference in perceived benefits between the two groups before the intervention. However, after the intervention, the perceived benefits in the intervention group were significantly higher than those in the control group ( $P < 0.001$ ) but in the control group did not change significantly after the intervention compared with before. In contrast, in the intervention group, perceived benefits increased significantly after the intervention ( $P < 0.001$ ).

In Table 3, perceived barriers were compared between the control and intervention groups using an independent-samples t-test, and the paired-samples t-test was used to compare perceived barriers before and after the intervention. The results of the independent samples t-test showed that there was no significant difference in perceived barriers between the two groups before the intervention. However, after the intervention, perceived barriers in the intervention group were significantly higher than

those in the control group ( $P < 0.05$ ). The paired-samples t-test results indicated that perceived barriers in the control group did not change significantly after the intervention compared to before. In contrast, in the intervention group, perceived barriers increased significantly after the intervention ( $P < 0.01$ ).

In Table 4, the "cue to action" (action guidance) scores before and after the intervention were compared between the control and intervention groups using the independent t-test and Mann-Whitney test, respectively. To compare the scores before and after the intervention within each group, the Wilcoxon signed-rank test was used. The independent t-test showed no significant difference between the two groups in cue-to-action scores before the intervention. However, after the intervention, the intervention group's cue-to-action scores were significantly higher than those of the control group ( $P < 0.001$ ). The Wilcoxon test indicated that cue-to-action scores in the control group did not change significantly after the intervention compared with before. In contrast, in the intervention group, these scores increased significantly after the intervention ( $P < 0.001$ ).

**Table 2. Comparison of Perceived Benefits Between Control and Intervention Groups Before and After Intervention**

| Group          | Perceived Benefits (Mean $\pm$ SD)                        | Statistical Test           | P-Value                             |
|----------------|-----------------------------------------------------------|----------------------------|-------------------------------------|
| Control        | Pre-test: 42.44 $\pm$ 8.02<br>Post-test: 41.87 $\pm$ 7.73 | Wilcoxon Signed Ranks Test | 0.732                               |
| Intervention   | Pre-test: 43.92 $\pm$ 8.93<br>Post-test: 48.64 $\pm$ 5.27 | Wilcoxon Signed Ranks Test | 0.002                               |
| Between Groups | —                                                         | Mann-Whitney Test          | Pre-test: 0.117<br>Post-test: 0.027 |

**Table 3. Comparison of Perceived Barriers Between Control and Intervention Groups Before and After Intervention**

| Group          | Perceived Barriers (Mean $\pm$ SD)                        | Statistical Test         | P-Value                             |
|----------------|-----------------------------------------------------------|--------------------------|-------------------------------------|
| Control        | Pre-test: 29.49 $\pm$ 7.15<br>Post-test: 29.09 $\pm$ 5.99 | Paired Samples Test      | 0.732                               |
| Intervention   | Pre-test: 27.66 $\pm$ 6.02<br>Post-test: 31.64 $\pm$ 7.00 | Paired Samples Test      | 0.002                               |
| Between Groups | —                                                         | Independent Samples Test | Pre-test: 0.117<br>Post-test: 0.027 |

**Table 4. Comparison of Cues to Action Between Control and Intervention Groups Before and After Intervention**

| Group          | Cues to Action (Mean $\pm$ SD)                      | Statistical Test                        | P-Value                       |
|----------------|-----------------------------------------------------|-----------------------------------------|-------------------------------|
| Control        | Before: 19.04 $\pm$ 4.95<br>After: 17.43 $\pm$ 4.67 | Wilcoxon Signed Ranks Test              | 0.080                         |
| Intervention   | Before: 18.13 $\pm$ 4.96<br>After: 21.49 $\pm$ 3.65 | Wilcoxon Signed Ranks Test              | 0.000                         |
| Between Groups | —                                                   | Independent Samples / Mann-Whitney Test | Before: 0.299<br>After: 0.000 |

## Discussion

The results of our study showed that, as with the other two constructs, perceived benefits and barriers increased significantly in the intervention group following training. In contrast, no significant changes were observed in the control group. Prior to training, there were no significant differences in perceived benefits and barriers between the intervention and control groups. However, after training, the mean scores of both perceived benefits and barriers in the intervention group were significantly higher than those in the control group.

Elshahat et al. showed that the construct of perceived benefits of physical activity in the experimental group increased significantly after training, whereas no such increase was observed in the control group, which aligns with the findings of the present study [9]. The increase in perceived benefits of engaging in physical activity can be attributed to the emphasis on the physical and psychological benefits of exercise, its role in disease prevention, and the inclusion of related educational content during the training. According to researchers, an individual's perception of benefits facilitates the path to action [10].

Seol et al. also reported a significant difference in the experimental group, compared with the control group, in the perceived barriers component after the educational intervention, consistent with the present study [11]. Additionally, the increase in perceived benefits and barriers in the intervention group in our study aligns with the findings of Nori et al [12] and Khodaveisi[13], who showed that the Health Belief Model effectively increased perceived benefits in the intervention group but was less successful in reducing perceived barriers, likely due to reduced follow-ups and participants reverting to their previous lifestyle.

Sasanfar et al. noted that perceived barriers are the most important component of the Health Belief Model in the performance of recommended behaviors. Other studies indicate that if perceived barriers outweigh perceived benefits, the likelihood of behavior occurrence decreases [14]. In other words, an individual's behavior is determined by the balance or imbalance between perceived positive and negative forces regarding a health behavior.

Factors such as limited time for exercise, lack of perceived need to follow health-promoting behaviors, decreased interaction with medical team members, weak social support, low self-efficacy, low education level, being unmarried, older age, religion, low self-control, physical limitations, living alone, chronic diseases, lack of educational classes, financial issues,

and family barriers are among the most important obstacles to following health-promoting behaviors. Perceived barriers are among the strongest predictors of adherence to health-promoting behaviors. Identifying and reducing perceived barriers can improve patient care quality and guide educational program planning to promote behavior change [15-17]. Park et al. demonstrated that by addressing perceived barriers, patients with diabetes walked more frequently [18]. Tefera's study showed that reducing perceived barriers led to decreased self-medication among women [19]. Shajrawi et al. reported an inverse relationship between perceived barriers and health behaviors; the greater the perceived ability to overcome barriers, the higher the likelihood of engaging in health behaviors [20].

In the present study, the mean scores for action guidance for physical activity before training did not differ significantly between the control and intervention groups; however, after training, the mean scores of the intervention group were significantly higher than those of the control group. Furthermore, the mean action guidance scores in the intervention group increased significantly after training compared with before, whereas no significant change was observed in the control group. These findings are consistent with other studies on this construct, including those by Khodaveisi et al. [13], Nematzad et al. [17], and Tavakoli et al. [5]. Notably, the mean action guidance score in the control group also increased alongside that of the intervention group, although this change was not statistically significant; it was close to significance ( $P = 0.08$ ). This increase in action guidance scores in the control group may be due to 1) potential interactions between some employees in the control and intervention groups, allowing the transfer of some educational points from the intervention group, and 2) external factors such as media programs and advertisements that may have influenced the control group's action guidance scores.

## Limitations

This study had several limitations. The follow-up period was relatively short, which limited the assessment of long-term sustainability. Physical activity was measured using self-reported questionnaires, which may have been subject to recall bias. Additionally, the study was conducted at a single university and had a limited sample size, which may have limited the generalizability of our findings. Future studies should consider longer follow-up periods, objective measures of physical activity, and a more diverse sample to strengthen this evidence.

## Recommendations

Future research should focus on more extended follow-up periods to assess the sustainability of behavior changes and use objective measures of physical activity, such as pedometers or accelerometers, to reduce self-report bias. Expanding the sample to include diverse populations from multiple workplaces or cultural backgrounds will enhance generalizability. Interventions should also actively address perceived barriers through practical strategies while considering additional psychosocial factors, including intrinsic motivation, social support, and mental health, alongside self-efficacy, to strengthen the effectiveness of HBM-based programs.

## Conclusion

This study indicates that education based on the Health Belief Model effectively enhances employees' physical activity by increasing perceived benefits, reducing perceived barriers, and strengthening cues to action. Self-efficacy is a key predictor of behavior change. These results suggest that workplace interventions targeting employees' beliefs and perceptions can promote regular physical activity, contributing to better health outcomes and preventing chronic diseases.

## Authorship contribution statement

All authors have reviewed and approved the final version of the manuscript. BA conceived and designed the study. BA and ES conducted the study and collected the data, performed the data analysis and interpretation.

## Ethical Consideration

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran (code: IR.UMSHA.REC.1396.815). All participants were informed about the study objectives and procedures, and written informed consent was obtained from each participant prior to data collection. The confidentiality and anonymity of participants were fully maintained throughout the study.

## Declaration of Competing Interest

The authors have no conflict of interests related to this article.

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## Data Availability

This study is a narrative review and does not include any new, primary data. All data supporting the findings of this study are derived from previously published articles and sources, which are cited within the manuscript. Therefore, no additional data are available.

## Declaration of Generative AI

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables, or their corresponding captions.

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