

# Effective Factors on Health-Promoting Lifestyle Among Iranian Chemical Veterans in 2014 Based on Health Promotion Model: A Path Analysis

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## Abstract

**Background:** Health-promoting behaviors can enhance physical and mental health among individuals with disability, particularly veterans.

**Objectives:** The current study aimed to examine both one-way direct and indirect effects of the factors of the Health Promotion Model (HPM) on health-promoting behaviors in chemical veterans from Ilam province in Iran.

**Materials and Methods:** This cross-sectional study was conducted in 2014. In this study, 239 moderate-to-severe chemical veterans from Ilam province supported by the veterans' affairs department of Ilam were evaluated via census sampling. Data including health-promoting behaviors, perceived self-efficacy, perceived barriers and benefits, perceived social support, and perceived health status were collected using standard questionnaires.

**Results:** The results show that the HPM is a poor predictor of the health-promoting lifestyles of chemical veterans ( $R^2 = 15\%$ ). Social support (factor loading = 0.38) is the strongest predictor of health-promoting behaviors and it influences such behaviors directly, while perceived barriers (factor loading = -0.11) and perceived self-efficacy (factor loading = 0.02) indirectly predict behavior through social support.

**Conclusions:** Perceived social support is the most important factor that influences health-promoting behaviors. Increasing social support by enhancing self-efficacy and decreasing perceived barriers can improve health-promoting behaviors among veterans.

**Keywords:** Health Behavior, Health Promotion Model, Chemical Veteran, Path Analysis, Iran

## 1. Background

Mustard gas can cause numerous complications in the skin, eye, gastrointestinal, and respiratory systems (1). Late complications resulting from exposure to chemical warfare affect injured patients with chronic diseases. Hence, many changes in these patients are irreversible (2). Physical and psychological disabilities can establish limitations in usual activities, occupational tasks, social actions, and the quality of life in chemical victims (3). Quality of life is a broad concept that involves all of aspects of life including physical, social, and spiritual (4). Health-promoting lifestyle is closely related to veterans' physical and psychological health status and, therefore, to their quality of life. Health-promoting behaviors are defined as real human desires that propel individuals to maximize health, personal performance, and productive lives. According to Pender et al., health promotion is a dynamic and positive process that encompasses behaviors supporting a healthy lifestyle,

including physical activity, dieting, spiritual growth, interpersonal relationships, health responsibility, and stress management. They defined health-promoting behaviors as voluntary daily activities derived from environmental, demographical, and social variables and that such activities can affect one's health conditions. In other words, a health-promoting lifestyle is a multi-dimensional pattern of voluntary behaviors needed for promoting one's health conditions, self-growth, and perfection (5).

Health promotion theories and models can facilitate establishing, maintaining, and improving healthy behaviors by predicting factors influencing risky behaviors (6-8).

Penders' health promotion model (HPM) is a comprehensive and predictive model that can provide a theoretical framework to explore the factors influencing health-promoting behaviors. The first version of HPM was used as a framework to testing its capabilities in predicting a health-promoting lifestyle, but several constructs such as importance of health, definition of health, and perceived

control of health were deleted owing to lack of sufficient empirical evidence of predictive power and several constructs were added; therefore, the model was revised (5).

In the revised model, the included concepts of health-promoting behavior are individual characteristics and experiences, behavior-specific cognitions and affects, and behavioral outcomes. The concept of individual characteristics and experiences has direct and indirect effects (through cognition and affects factors) on behavior, and it includes personal factors and prior related behaviors. The concept of behavior-specific cognitions and affects has a direct effect on behavior, and it includes constructs such as perceived benefits and barriers, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences. Pender tested his model in multiple studies and identified constructs such as personal factors (perceived health status), perceived benefits and barriers, perceived self-efficacy, and interpersonal influences (social support) as the best predictors a health-promoting lifestyle (5). However, existing evidences indicate that the factors influencing each specific behavior should be assessed independently (9).

Research in Iranian elders with several disabilities showed that social support was the most important determinant factor in performing day-to-day activities (10). A study in persons with multiple sclerosis showed that enhancing social support, lowering barriers, and increasing specific self-efficacy for health behaviors results in improved health-promoting behaviors and quality of life (11). In diabetic females with physical disability, the perceived self-efficacy, perceived benefits, and perceived health status are effective factors on physical activity behaviors and the perceived health status construct is an effective indirect factor influencing physical activity (12).

## 2. Objectives

Veterans with numerous disabilities need to change to a health-promoting lifestyle, and although HPM clearly identifies the constructs leading to health-promoting behaviors, the relationships among the constructs are less clear. Therefore, the purpose of the current study was to investigate the direct and indirect relationships between HPM constructs and health-promoting behaviors in veterans, as well as the effectiveness of the model in predicting health-promoting behaviors.

## 3. Materials and Methods

### 3.1. Study Design

In this cross sectional study, 276 moderate-to-severely affected chemical veterans living in Ilam province were re-

cruited between July and November 2014 via census sampling. Veterans more than 25 percent were categorized as moderate and severe based on the medical committee of department of veterans' affairs (DVA). Ilam province is one of the western provinces of Iran. It covers an area of 20,132.844 square kilometers and its population is 557599 people. The province has temperate climate in the north, and warm and semi-warm climate in the south. The inclusion criteria included having suffered from moderate-to-severe levels of injury and having adequate physical health. However, individuals who did not comply with the study procedures, not satisfied about participating in the study, or without permanent residence in Ilam Province were excluded from the study.

For sampling, first, the complete list of chemicals veterans' names and phone numbers was obtained from the department of veterans' affairs (DVA). Then, through telephone contact, explanations regarding the targets, procedures, and confidential rules of the research were presented to potential study participants. Thereafter, if a veteran expressed desire to participate in the investigation, the researcher would visit their home to collect data. The participants were told that all information would be kept secret and anonymous. Then, they were requested to choose the best options as their answers to questions. Of the 276 referred veterans, six died, three were not able to respond to the questions, 15 submitted incomplete questionnaires, and 13 moved out of Ilam. Therefore, finally, 239 veterans (86.6% response rate) entered into the study.

### 3.2. Instruments and Measures

A self-administered questionnaire, the health-promoting lifestyle profile II (HPLP II) questionnaire, and five standard instruments regarding Pender models' constructs, including perceived health status, perceived benefits, perceived barriers, social support, and self-efficacy, were used to collect data. All instruments were first translated by the primary investigator and then a bilingual person translated them back to English; all differences were improved. The translated instruments were reviewed by a group of Iranian health education experts, and minor amendments were made to them. Prior to data collection, the questionnaires were tested for reliability in a sample of 50 chemical veterans. In this study, all questionnaires were reliable and the ranges of Cronbach's alpha coefficients were 0.82 (perceived health status)-0.92 (HPLP II).

The self-administered questionnaire queried age, gender, occupation, disability, type of injury, and militancy type.

The HPLP II included 52 questions, and all items are scored using a Likert scale ranging from 1 (never) to 4 (al-

ways). Therefore, the total questionnaire score ranges between 52 and 208. This standard questionnaire for measuring health-promoting behaviors includes six dimensions, namely, health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management. Higher scores indicate more favorable conditions in veterans in terms of health-promoting behaviors. Walker and colleagues reported Cronbach's alpha of 0.94 for this instrument (13-15). In this study, for this instrument, we obtained Cronbach's alpha of 0.92, and content validity index (CVI) values in terms of simplicity, precision, and specificity were 0.91, 0.97, and 0.91, respectively.

The perceived health status questionnaire is a 12-item scale covering physical and mental health. Response categories for items vary from 2- to 6- point scales, and raw scores for items range from 1 to 6. Physical domain scores range from 6 to 20, and mental domain scores range from 6 to 27. Montazeri et al. reported Cronbach's alpha of 0.73 for the physical health subscale and 0.72 for the mental health subscale in Iranian people. Furthermore, explanatory factor analysis (16) and confirmatory factor analysis (CFA) indicated good fit validity for this tool (17). Given these previous evaluations of this questionnaire in Iran, we did not validate it in the present study.

The standard multidimensional scale of perceived social support contains 12 items and assesses three subscales, namely, family, friends, and other significant individuals' support. The items are scored on a 7-point Likert scale ranging from strongly disagree (1 point) to strongly agree (7 points), and the total questionnaire score ranges from 12 to 84. Psychometric studies have indicated good reliability ( $\alpha = 0.91$ ). Moreover, Cronbach's alpha coefficient of this scale was 0.94, which indicates good internal consistency (18). In this study, the CVI values for simplicity, precision, and specificity were 0.93, 0.96, 0.91, respectively, and Cronbach's alpha was 0.87, for this instrument.

The scales regarding perceived benefits of and perceived barriers to health-promoting behaviors comprised 26 and 18 questions, respectively. The items of these questionnaires were evaluated on a 3-point Likert scale. Cronbach's alpha for the benefits and barriers scales were 0.82 and 0.60, respectively (10). The CVI values for simplicity, precision, and specificity for the perceived benefits questionnaire were 0.99, 0.96, and 0.99, respectively, while those for the perceived barriers questionnaire were 0.98, 0.98, and 0.91. Furthermore, the reliability scores of the benefits and barriers scales were 0.91 and 0.88, respectively, in this study.

Perceived self-efficacy has been defined as people's judgments on their own possibilities for indulging in health-promoting behaviors. Becker et al. designed this scale for measuring six dimensions of health-promoting

behaviors. The 26 items comprising this questionnaire are scored on a 4- point Likert scale from never (1 point) to always (4 points) with the total score ranging from 26 to 104. This scale had a Cronbach's alpha of 0.92 (19). Its CVI values for simplicity, precision, and specificity were 0.99, 0.98, and 0.98, respectively, which indicate its appropriateness of content validity. The reliability score of this scale was obtained as 0.90.

### 3.3. Data Analysis

The collected data were coded and entered into statistical package for social sciences (SPSS) version 18.0. Descriptive statistics were used to examine the sample characteristics.

Data were analyzed by path analysis using LISREL version 8.80. Path analysis was used for studying the direct and indirect effects of variables and for estimating the values of coefficients in the underpinning linear model. Mardia's coefficient for multivariate skewness and kurtosis was estimated to be 5.643. This value was significant ( $P = 0.04$ ); therefore, a few of the variables (such as age, social support, perceived benefits, and health status) were non-normal and we used the robust maximum likelihood estimation procedure. A correlation matrix and an asymptotic covariance matrix were applied for model estimation. Chi-square ( $\chi^2$ ), the adjusted goodness-of-fit index (AGFI), and root-mean-square error of approximation (RMSEA) were used as model fit criteria. The model was considered fit if  $AGFI > 0.8$  and if  $RMSEA < 0.05$ . The comparative Bentler-Bonett Non-Normed Fit Index (NNFI) was selected. NNFI values equal to or greater than 0.90 are recommended as acceptable values for this measure. T value was used for elimination of parameters in the path analysis, and the modification index was used for inclusion of additional parameters.

### 3.4. Ethical Principles

The aim of the study was verbally explained to the potential participants who met the inclusion criteria. The participants were told that all information (such as name, address, percentage of injury, etc.) would be kept secret and anonymous. The participants were told that they could withdraw from the study at any time. The required permissions were obtained from the vice-chancellor of research, Bushehr University of Medical Sciences, department of education in Bushehr city, and department of veterans' affairs. Furthermore, the study was approved by the university ethics committee with ethics number 20.71.208.

#### 4. Results

In total, 239 chemical veterans entered into the study with mean age of  $51.17 \pm 8.87$  years. Most veterans were 25% veteran (52.3%,  $n = 125$ ), 27.6% ( $n = 66$ ) were 30%, 9.6% ( $n = 23$ ) were 35%, and 9.2% ( $n = 22$ ) had 40% or higher percent of veteran. In this study, 43.9% ( $n = 105$ ) of the subjects were chemical veterans, 13.4% ( $n = 32$ ) were physico-chemical veterans, 37.7% ( $n = 90$ ) were neuro-chemical veterans, and 4.6% ( $n = 12$ ) had all aforementioned afflictions. Of these, 44.4% ( $n = 106$ ) were voluntary participants in combat situations, 32.6% ( $n = 78$ ) were soldiers, and 23% ( $n = 51$ ) were military personnel. Of all the participants, 35.1% ( $n = 84$ ) were employed, 34.7% ( $n = 83$ ) were pensioners, and 29.8% ( $n = 109$ ) had other jobs.

Average responses to the five constructs and the HPLP II are summarized in Table 1. The results (according to mean values obtained) demonstrate that the participants in this study had poor of HPLP. Moreover, the veterans perceived medium levels of health status, self-efficacy, and perceived barriers related to HPLP.

The relationships among the model constructs and HPLP are summarized in Table 2. Accordingly, positive associations were found between HPLP and all constructs, except perceived barriers. Therefore, the veterans who had higher perceived barriers were reported to have poorer HPLP.

The original hypothesized model did not fit the data well ( $\chi^2 = 147.72$ ,  $df = 6$ ,  $P = 0.000$ ,  $RMSEA = 0.32$  (0.28 - 0.36),  $NNFI = 0.44$ ,  $GFI = 0.89$ ,  $AGFI = 0.17$ ). Path analysis revealed that some coefficients were significant and others were not. After considering the results of the original model and the related theoretical issues, the model was modified by removing non-significant coefficients one-by-one between demographic factors and model constructs. Therefore, age and occupation were omitted from the model. The fit indices indicated improvement of the modified model over the original model ( $\chi^2 = 13.78$ ,  $df = 18$ ,  $P = 0.743$ ,  $RMSEA = 0.00$  (0.00 - 0.04),  $NNFI = 0.98$ ,  $GFI = 0.94$ ,  $AGFI = 0.89$ ). Critical N (Hoelter's Index) in this model was 601.94, which suggests that sample size cutoff for testing the model was more than satisfied. The coefficients between the variables were improved, and all paths in the modified model were significant. Fit indices such as GFI and AGFI indicated good fit of the model (values > 0.9) (Table 3).

According the results, among personal factors, perceived health status had the most effect on HPLP with factor loading of 0.15. The variables age and occupation did not have direct or indirect effects on HPLP and were omitted from the model.

In this study, among the model constructs, the factor with the most effect on HPLP was social support with the

highest factor loading of 0.382. The results indicate that only the social support construct affected HPLP directly. Moreover, this construct affected HPLP indirectly through perceived barriers. Other constructs, except perceived benefit, had indirect effects on HPLP. The results indicate that all constructs, except perceived barriers, positively influenced HPLP, and perceived benefit had no effect on HPLP. The pathways across personal factors, constructs, and HPLP are shown in Figure 1. This model accounted for only 15% of the variance in HPLP among chemical veterans. Direct and indirect influences of the personal factors and model constructs on HPLP are summarized in Table 4.

#### 5. Discussion

In this study, we aimed to identify the direct and indirect factors affecting health-promoting behaviors in chemical veterans based on the HPM. In this study, the mean scores of health-promoting behaviors in veterans was lower than that shown in Harooni's study, which was conducted among the elderly in Dena province (20). The results of the present study are consistent with the findings of several studies (10, 21-24), indicating the inappropriate status of health-promoting behavior in veterans.

The results show that HPM as a theoretical framework for this study is a poor predictor of health-promoting lifestyle in chemical veterans ( $R^2 = 15\%$ ). In this study, no correlation was observed between the individual characteristics and experiences of veterans regarding health-promoting lifestyles. However, all demographic variables, except age and occupation, had indirect effects on health-promoting behaviors. One study showed only housing status was associated with quality of life (25). Consistent with this study, other studies have shown personal factors have no significant direct effects on HPLP subscales (26-28).

Similar to the findings of several studies (29, 30), our findings show that perceived health status was the most important predictor of HPLP of veterans, so individuals with better perceived health indulged in more health-promoting behaviors.

This study showed that all structures, except perceived barriers, had positive effects on health-promoting behaviors. In addition, among the model constructs, perceived benefits had no effect on health-promoting behaviors and this result is in contradiction with the findings of a few other studies. In an Iranian study among elderly people, perceived benefits was shown to have a direct effect on health-promoting behaviors. Moreover, this construct had direct effects on oral health behavior and on the use of hearing protection devices (31, 32). In the present study, the impact of perceived benefits was covered by other constructs, so it was removed from the model.

**Table 1.** Means, Standard Deviations, Minimum, and Maximum of Constructs and HPLP (N = 239)

Variables	Self-Efficacy	Social Support	Perceived Benefit	Perceived Barrier	Perceived Health Status	HPLP
Mean	56.15	66.06	68.75	35.41	24.72	129.29
Standard deviation	8.97	12.44	7.66	7.74	6.76	21.94
Min-Max	33 - 78	16 - 84	36 - 78	18 - 54	12 - 46	74 - 182
Range scale	26 - 78	12 - 84	26 - 78	18 - 54	12 - 47	52 - 208

**Table 2.** Correlation of Coefficient Between Constructs and HPLP (N = 239)<sup>a</sup>

Variables	HPLP	Social Support	Benefit	Barrier	Self-Efficacy	Health Status
HPLP	1	0.444	0.412	-0.219	0.633	0.283
Social support		1	0.260	-0.2	0.42	0.219
Benefit			1	-0.14	0.369	0.131
Barrier				1	-0.203	-0.226
Self-efficacy					1	0.343
Health status						1

<sup>a</sup>All P values < 0.001.

**Table 3.** Fit index of Path Analysis Model for Veteran's Health-Promoting Lifestyle (N = 239)

Indicators	Fit Index				Compared Models' Index			Index Briefly
	$\chi^2$	GFI	AGFI	RMSEA	NFI	NNFI	CFI	AIC
Original model	147.72	0.89	0.17	0.32 (0.28 - 0.36)	0.85	0.44	0.84	267.72
Final model	13.78	0.94	0.81	0.000 (0.000 - 0.043)	0.98	0.99	1	87.78

In accordance with some studies perceived barrier construct had negative and indirect effect on health-promoting behaviors through social support construct (10, 33). In other study, perceived barriers showed negative but direct effect on using of hearing protection behavior (12, 34).

In this study, similar to the findings of a previous study (34), perceived self-efficacy had indirect effects on health-promoting behaviors through social support and perceived barriers, but in several other studies, self-efficacy had both direct and indirect effects (10, 11, 35), and in other studies, this construct had only direct effects (28, 32, 33). Therefore, all studies showed a relationship between self-efficacy and health-promoting behaviors.

As shown in the present study, perceived social support was the most powerful predictor of health-promoting behaviors. This construct had a direct effect on health-promoting behavior. In several studies (11, 25, 28, 34-37), social support, too, had a direct effect on health-promoting behaviors and quality of life. However, in one study among pregnant women (38), social support was not a significant

predictor of health-promoting behavior. This contradiction may be owing to women's condition, indicating that these people are influenced by other factors to improve their health-related behaviors.

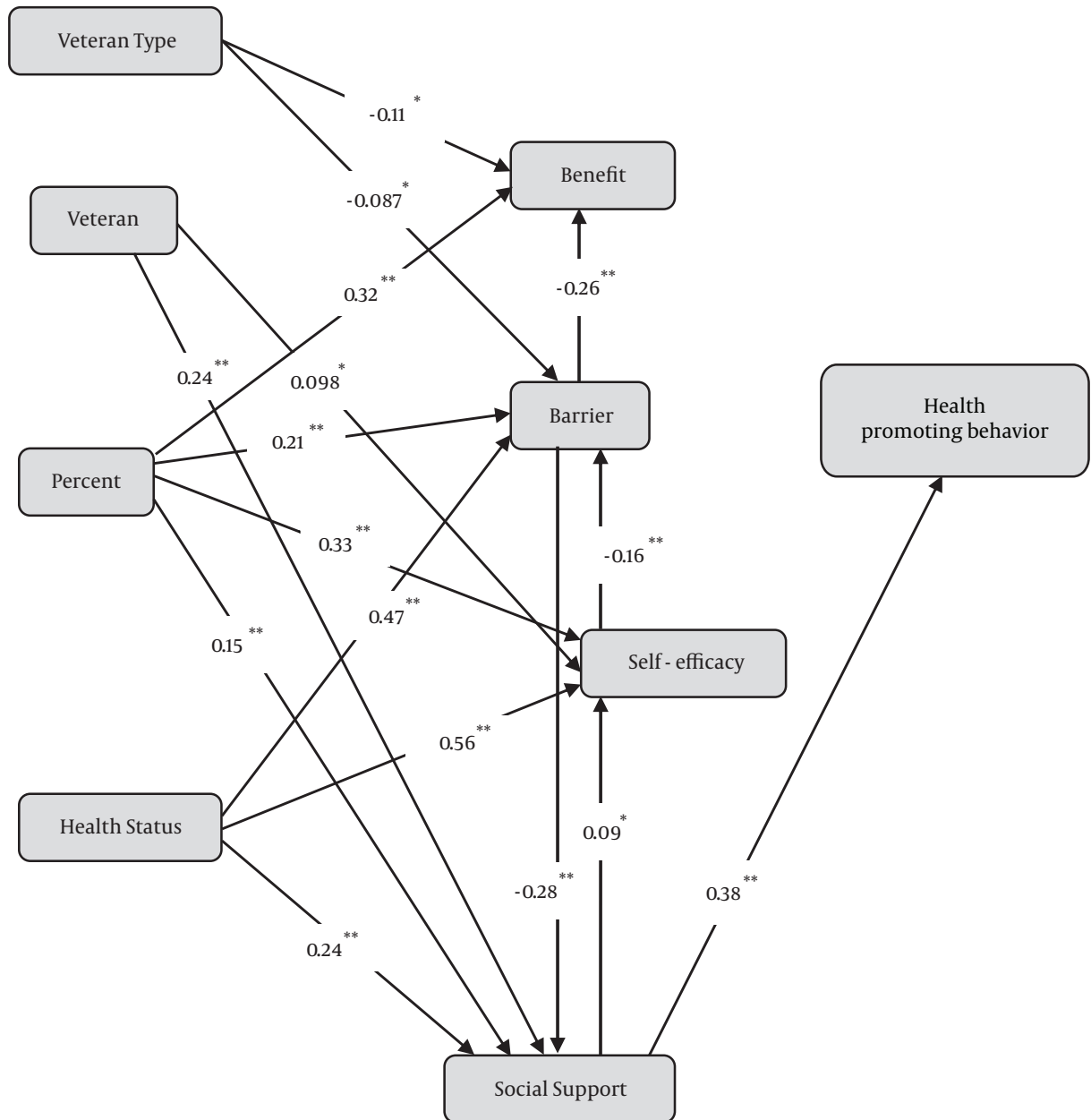
### 5.1. Conclusions

It can be concluded that to ensure the spread of health-promoting lifestyles in chemical veterans, it is necessary to increase social support. To this end, we should educate a variety of sources, including friends, family, and significant people to create support required to indulge in health-promoting behaviors. Additionally, veterans should be educated about strategies for overcoming barriers by using a variety of promoting self-efficacy strategies.

### 5.2. Limitations

Due to several problems and disabilities such as respiratory disorders in veterans, questionnaire fulfillment was difficult. Furthermore, similar studies on chemical veterans are limited, so comparing the findings of this study

Figure 1. Diagram of Path Analysis for Prediction of Veteran's Health-Promoting Behaviors



\*P value < 0.05; \*\*P value < 0.001.

with those of other studies was difficult. Further research on veterans should be conducted in the near future.

Despite the limitations of the present study, given that it was conducted only in Ilam province, the same study can be conducted in other provinces. Furthermore, in the present study, only veterans with moderate to se-

vere disabilities were included to avoid bias in the results. Nonetheless, the use of HPM as a theoretical framework and the census sampling procedure were strong points of this study.

**Table 4.** Direct and Indirect Influences of Personal Factors and Constructs on HPLP

Predictor Variables/Through	Causal Effect		
	Direct	Indirect	Total
<b>Veteran type</b>			-0.0096
Barr-SS-HPLP	-	-0.0096	
Total	-	-0.0096	
<b>Veteran</b>			0.0934
SE-Barr-SS-HPLP	-	0.002	
SS-HPLP	-	0.091	
SS-SE-Barr-SS-HPLP	-	0.0004	
Total	-	0.0934	
<b>Percent</b>			0.0852
Barr-SS-HPLP	-	0.022	
SE-Barr-SS-HPLP	-	0.006	
SS-HPLP	-	0.057	
SS-SE-Barr-SS-	-	0.0002	
HPLP			
<b>Health Status</b>			0.1501
Barr-SS-HPLP	-	0.05	
SE-Barr-SS-HPLP	-	0.0095	
SS-HPLP	-	0.091	
SS-SE-Barr-SS-HPLP	-	-0.0004	
Total	-	0.1501	
<b>Barrier</b>			-0.11
SS-HPLP	-	-0.11	
Total	-	-0.11	
<b>Self-efficacy</b>			0.02
Barr-SS-HPLP	-	0.02	
Total	-	0.02	
<b>Social support</b>			0.3815
HPLP	0.38	-	
SE-Barr-SS-HPLP	-	0.0015	
Total	0.38	0.0015	

Abbreviations: Barr, barrier; percent, disability percentage; SE, self-efficacy; SS, social support; veteran, militancy; veteran type, type of injury.

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## Footnotes

**Authors' Contribution:** Azita Noroozi contributed to the critical revision of the manuscript, as well as final approval of the study. Roghayeh Chenary and Maliheh Saeed Firoozabadi contributed to the provision, collection, and assembly of study data, as well as to writing the manuscript. Sedighe Sadat Tavafian contributed to critical revision.

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