Received: 14 September 2023 | Revised: 14 November 2023 | Accepted: 30 November 2023

DOI: 10.1002/hsr2.1778

ORIGINAL RESEARCH

Health Science Reports Open Access WILEY

Investigating the factors related to protective behaviors against COVID-19 in healthcare workers: Application of extended parallel process model

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Funding information
Isfahan University of Medical Sciences, Grant/Award Number: 3400732

Abstract

Background and Aims: Preventive behaviors against coronavirus disease 2019 (COVID-19) are important, and messages that create a sense of danger are necessary to create these behaviors. One of the widely used models for designing risk messages is the Extended Parallel Process Model (EPPM). The present study was conducted to investigate the factors related to protective behaviors against COVID-19 in the personnel of the health department based on EPPM.

Methods: In this cross-sectional study, 699 personnel of the deputy health department of Chaharmahal and Bakhtiari province were included in the study by census method. Data were collected online using valid questionnaires, including demographic questions and history of contracting COVID-19 and the questionnaire of EPPM constructs. Data were analyzed in SPSS24 software, using descriptive and analytical statistics.

Results: The results showed that there were positive correlations between the protective behaviors and the constructs of perceived severity ($p < 0.001$, $r = 0.542$), perceived susceptibility ($p < 0.001$, $r = 0.260$), self-efficacy ($p < 0.001$, $r = 0.594$), response efficiency ($p > 0.001$, $r = 0.522$), and risk control ($p > 0.001$, $r = 0.501$). There was a negative correlation between protective behaviors and fear control ($p < 0.001$, $r = 0.329$). The results of multiple linear regression showed that these six constructs explained 49.8% of protective behaviors against COVID-19, among which the role of the perceived severity construct was stronger than other constructs.

Conclusion: Regarding the results, it is suggested that the results of this research be used in the development of training programs to improve protective behaviors in high-traffic offices, and by focusing on fear and risk control.

KEYWORDS

COVID-19, Extended Parallel Process Model, healthcare workers, preventive behaviors

1 | INTRODUCTION

In December 2019, the infectious disease coronavirus disease 2019 (COVID-19) was identified for the first time in Wuhan, China due to the new coronavirus and became the pandemic of the century in a short period.[1] This disease also spread rapidly in Iran. Due to its prevalence and high rate of infection, it can quickly infect many people, especially healthcare workers. The common symptoms of the disease are fever, dry cough, fatigue, and lethargy, accompanied by anorexia and shortness of breath.[2] Therefore, emergency measures by governments in the field of treating patients, quarantine of suspicious and sick cases, protection of healthcare workers, and public health measures are necessary.[3]

Healthcare workers are at risk of contracting this disease by performing activities such as identification, treatment, and isolation of patients, and tracking and quarantining of cases in close contact with patients.[4] As a result, preventive measures in the field of personal protection are necessary for these people.[5] Ensuring the safety of health workers is also important because it protects them from the virus and prevents the spread of the virus in the community.[6] Therefore, determining effective factors for preventive behaviors of respiratory viral diseases should be identified to identify preventive measures and control viral infections.[7]

So far, many studies have been conducted to investigate the factors related to the adoption of preventive behaviors in viral diseases, and the results of the studies have shown that the use of a conceptual model based on factors related to risk perception can play an important role in the adoption of such behaviors. One of these models whose role has been investigated and proven in similar studies is Extended Parallel Process Model (EPPM). The EPPM is useful for understanding adaptive behavior in the face of unknown risk.[8]

According to research, fear-inducing theories are commonly used to study obstacles that prevent people from engaging in healthy behaviors and to describe their behavior. The EPPM is a theoretical framework that suggests people choose between two options when confronted with risk and threat, depending on their self-efficacy and risk analysis abilities; (a) Risk control: it is when the level of perceived efficiency of a person is higher than the level of perceived threat, such a situation allows the person to take preventive action against the risk or exposure factors, and (b) fear control: It is when the level of the perceived threat of a person is more than the level of perceived efficiency, which causes a person to adopt a passive mechanism when faced with danger and abandon preventive behaviors.[8]

This model, first proposed by Witte in the early 1990s, represents the integration and expansion of psychological models such as fear appeal. This model focuses on messages received by individuals and collectively.[9] Considering that health messages are designed to change people's behavior in the field of health, these messages should be designed and prepared according to people's beliefs and concerns[10] messages containing risk can lead to positive changes in preventive and protective behaviors of the audience.[11]

Highlights

- The Extended Parallel Process Model (EPPM) model was suitable for predicting protective behaviors against the coronavirus disease 2019 (COVID-19) disease.
- Except for the fear control construct, the rest of the constructs of the EPPM model are correlated with protective behaviors against the COVID-19 disease.

To influence people's behavior to follow COVID-10 health recommendations, it is important to understand how people perceive the COVID-19 pandemic, how they evaluate these risks, and how such evaluations may lead them to change their behaviors. In Iran, since the spread of the COVID-19 virus, studies have been conducted based on behavior change models and theories, as well as an EPPM.[12,13] In these studies, it has been determined that the perception of the risk of infectious diseases is different based on economic, social, and population characteristics[14] and there are contradictions in the findings of these studies in the field of constructs affecting the desired behaviors. Therefore, it is necessary to identify risk perception in different populations and regions.[12–15]

In a review study, Cipolletta et al.[16] showed that risk perception towards COVID-19 predicts adherence to preventive behaviors and social distancing measures. In addition, risk awareness is related to demographic, individual, geographic and time factors.[16] In the study of Harper et al.,[14] it was also shown that people's perceptions about COVID-19 can affect their behavior towards it, and these perceptions differ based on individual and cultural differences in each person. Other studies have also shown that people's perception of risk from COVID-19 has a significant impact on how they manage their mental health during the pandemic[17] as well as how they protect themselves and engage in preventive behaviors against it.[18]

According to the necessity of strict adherence to health protocols and performing protective behaviors against contracting this disease among healthcare workers, examining the attitudes and beliefs of these people regarding protective behaviors against COVID-19 can be effective in designing appropriate educational interventions and implementing them.; Therefore, according to the role of the EPPM in the analysis of beliefs related to performing protective behaviors against contracting diseases, the present study aims to investigate the factors related to protective behaviors against COVID-19 in the personnel of the health department of Shahrekord University of Medical Sciences based on the EPPM was performed.

2 | MATERIALS AND METHODS

This research was conducted as an online cross-sectional study in 1400 in Iran. The statistical population of this research was all the personnel working in the deputy health department of Shahrekord

University of Medical Sciences. All personnel working in the Health Vice-Chancellor of Shahrekord University of Medical Sciences with or without a history of COVID-19 who were willing to participate in this study were included in the study by census method (720 people).

An electronic questionnaire was used to collect data. After obtaining the necessary permits, the link to the questionnaire would be sent to personnel through Telegram, WhatsApp, and email applications. The electronic questionnaire included the following three parts: (a) informed consent; (b) demographic information and history of contracting COVID-19 (age, sex, education level, socioeconomic status, number of family members, history of contracting COVID-19 in the individual and his family, and the place of care for them and the amount of daily activity at home and outside the home); and (c) standard questionnaire based on the EPPM: this questionnaire contains 32 questions and in the form of seven constructs including risk control (four questions), self-efficacy (four questions) question), perceived susceptibility (four questions), perceived severity (three questions), response efficiency (six questions), fear control (eight questions) and behavior (four questions). The method of scoring the questions is based on a 5-point Likert scale (strongly agree, agree, no opinion, disagree, and strongly disagree) from 1 to 5, and the range of scores for the whole questionnaire is between 32 and 160. The study of Jahangiri et al.[13] was used for the content of EPPM construct questions). The validity and reliability of this questionnaire have been confirmed in previous studies (Cronbach's $\alpha = 0.69–0.79$).[13] The response rate of the participants to this questionnaire was 93%.

After collecting the data, they were entered into the SPSS24 software (SPSS Inc.). To describe the data, descriptive statistics (frequency, percentage, mean, and standard deviation) and to analyze the data, analytical statistics (test Pearson correlation, *T*-test, one-way analysis of variance, and multiple linear regression) were used. $p < 0.05$ was considered as the level of statistical significance.

3 | RESULTS

This study was conducted on 669 people. The average age of the participants in this study was 35.11 ± 7.4 years. 55.5% (369) of the participants were male and 44.5% (298) were female. 46.3% (310 people) of these people had a bachelor's education. In terms of the economic status of the family, 60.1% (402 people) of these people were in good economic status. 447 people (67%) of the participants in the study reported a history of being infected with COVID-19. Among these people, six people (1.1%) were hospitalized and received the necessary care. According to the data, 82.5% of the participant's family members were infected with COVID-19, which amounts to 552 people. Out of these infected individuals, 9.1% (61 people) required hospitalization. It was found that 60.2% of these people received information about the virus from sources other than their healthcare providers. On average, the infected individuals spent 5.59 ± 3.4 h per day engaged in activities at home and 7.82 ± 3 h per day engaged in activities outside the home. These statistics can be seen in Table 1.

The frequency distribution of EPPM questionnaire constructs is shown in Table 2. The results showed that the average answer to six questions related to the construct of response efficiency was 25.40 ± 3.2. The mean of self-efficacy construct (four questions) was 16.15 ± 2.6, perceived susceptibility construct (three questions) 12.52 ± 1.7, fear control construct (eight questions) 17.19 ± 5.8, risk control construct (four questions) 14.58 ± 2.6, the construct of perceived severity (three questions) was 11.98 ± 1.8, and the construct of protective behaviors related to COVID-19 (four questions) was 15.2 ± 2.6. Among these constructs, the fear control construct had the lowest value compared to its maximum values (42.5%). And the effectiveness of the answer was high in them.

TABLE 1 Frequency distribution of demographic variables and history of infection with COVID-19 in people participating in the study and their family members.

Variables		Frequency (percentage) Total count = (669 people)
Age (years)	Mean ± standard deviation	7.4 ± 35.11
Sex		
	Man	(55.2%)369
Education	Elementary	23 (3.4%)
	Diploma	114 (17%)
	Associates' degree	97 (14.5%)
	Bachelor's degree	310 (46.3%)
	Master's degree	83 (12.4%)
	Doctoral degree (PhD)	40 (6%)
The economic situation	Bad	257 (38.4%)
	Good	402 (60.1%)
	Very good	8 (1.2%)
COVID-19 infection	Yes	446 (67%)
Care location for COVID-19 patient	Home	441 (98.9%)
	Hospital	6 (1.1%)
Family members' COVID-19 infection	Yes	552 (82.5%)
Care location for family members in case of COVID-19 infection	Home	491 (73.4%)
	Hospital	61 (9.1%)

Abbreviation: COVID-19, coronavirus disease 2019.

TABLE 2 Frequency distribution of scores on EPPM questionnaire constructs.

Constructs	Number of questions (score range)	Mean ± standard deviation	Minimum	Maximum
Response efficacy	6 (6–30)	25.40 ± 3.2	6	30
Self-efficacy	4 (4–20)	16.15 ± 2.6	4	20
Perceived susceptibility	3 (3–15)	12.52 ± 1.7	6	15
Fear control	8 (8–40)	17.19 ± 5.8	8	40
Risk control	4 (4–20)	14.58 ± 2.6	4	20
Perceived intensity	3 (3–15)	11.98 ± 1.8	3	15
COVID-19-related behavior	4 (4–20)	15.2 ± 2.6	5	20

Abbreviation: EPPM, Extended Parallel Process Model.

TABLE 3 Correlation of scores on perceived severity, perceived susceptibility, self-efficacy, response efficacy, fear control, and perceived control constructs with protective behavior scores related to COVID-19 and age.

Constructs	Score of COVID-19 protective behavior Correlation coefficient (*p*-Value)	Age Correlation coefficient (*p*-Value)
Response efficacy	0.522 (<0.001)	−0.002 (0.955)
Self-efficacy	0.592 (<0.001)	−0.111 (0.004)
Perceived susceptibility	0.260 (<0.001)	0.006 (0.879)
Fear control	−0.329 (<0.001)	−0.165 (<0.001)
Risk control	0.501 (<0.001)	−0.112 (<0.001)
Perceived intensity	0.541 (<0.001)	−0.032 (0.413)

Abbreviation: COVID-19, coronavirus disease 2019.

The correlation coefficient of age and the score of protective behavior against the COVID-19 disease with the constructs perceived severity, perceived susceptibility, self-efficacy, response self-efficacy, fear control, and risk control are shown in Table 3. The results show that except for the fear control construct, the rest of the constructs have a direct correlation with the behavior score. Also, the constructs of self-efficacy ($p = 0.004$), fear control, and risk control ($p < 0.001$) have an inverse correlation with increasing age (Table 3).

The multiple linear regression method was used to predict the protective behavior against Covid-19. All the constructs of perceived severity, perceived susceptibility, self-efficacy, response self-efficacy, fear control, and risk control were simultaneously entered into the regression model (Enter method). Based on the regression results, the constructs of perceived susceptibility with $p = 0.64$, and response efficacy with $p = 0.064$ did not have significant predictive power for the prevention behavior of covid 19. The rest of the constructs were able to predict the score of prevention behavior against COVID-19 with a $p < 0.001$ (Table 4).

4 | DISCUSSION

In this study, using EPPM constructs, it was determined that there is a positive and significant correlation between protective behaviors with the constructs of perceived severity, perceived susceptibility, self-efficacy, response efficiency, and risk control, and there is a negative and significant correlation between protective behaviors and fear control. has it. These six factors are an important factor in the willingness of health department personnel to take protective measures against COVID-19.

To adhere to a certain behavior, it is necessary for a person to consider himself capable of performing that behavior and to strengthen this belief in himself.[19] The results of the present study showed a positive and significant relationship between the protective behaviors of these people and their self-efficacy. The positive relationship of self-efficacy with health-related behaviors has also been reported in the results of other studies, such as quitting smoking and preventing drug use.[20]

Based on the results of the present study, self-efficacy, and response efficiency had a positive effect on employees' willingness to protect themselves from illness. Therefore, if the employees feel that they are able to protect themselves against the disease and also imagine that these measures have the necessary effectiveness, they will be more willing to do them. Here we can mention the importance of education and awareness; so that if sufficient training is given to these employees, they will reach the self-confidence that they can handle protective measures well. Consistent with this finding, the results of the study of Sharifi Rad et al.[21] and the study of Azadeh et al.[22] reported a positive and significant correlation between self-efficacy and preventive behaviors. The results of the study by Constant et al.[23] also showed that perceived efficacy (which is a

TABLE 4 Regression results for explaining protective behaviors against COVID-19 using perceived severity, perceived susceptibility, self-efficacy, response efficacy, fear control, and perceived control in participants.

Variables	Unstandardized beta coefficient	Standard error of the coefficient	Standardized beta coefficient	*t*	*p*-Value
Response efficacy	0.059	0.032	0.075	1.86	0.064
Self-efficacy	0.322	0.041	0.32	7.78	<0.001
Perceived susceptibility	−0.021	0.045	−0.014	−0.47	0.64
Fear control	−0.058	0.013	−0.13	4.41	<0.001
Risk control	0.159	0.034	0.162	4.73	<0.001
Perceived intensity	0.407	0.046	0.285	8.79	<0.001

Abbreviation: COVID-19, coronavirus disease 2019.

combination of self-efficacy and response efficacy) is associated with proper adherence to preventive behaviors.

In this study, it was also shown that the construct of fear control had a statistically significant and negative relationship with protective behaviors against COVID-19. That is, the greater the control of fear in a person, the lower his protective behaviors. In justification of this, it can be said that according to the EPPM, two cognitive appraisals may be initiated after an individual is educated about a health risk: one related to the threat it poses and the other related to the effectiveness of following the recommended responses. When the threat of COVID-19 is perceived as more important and efficacy lower, people typically act to protect themselves from fear rather than the threat itself (fear control process). Conversely, when perceived efficacy is significantly high, people are usually motivated to protect themselves from risk and can manage the threat (risk control process).[11] In this regard, in this study, a statistically significant and positive relationship was seen between the risk control construct and protective behaviors against COVID-19.

In line with the results of the present study, in Emami and Mohebi's study,[24] the correlation between perceived susceptibility and protection motivation was positive and significant. This finding indicates that the more a person believes that failure to follow preventive principles can make a person sick with coronavirus disease and that this disease has serious complications, the more he intends to follow preventive principles.[24]

Shabu et al.[25] reported that despite the positive and significant correlation between risk perception and protective behaviors, the frequency of performing some important protective behaviors was relatively low. These results are contrary to the results of studies that show that the higher the perceived risk, the more protective measures people apply.[26,27]

The results of the data analysis in this study showed that the average score of fear control in the health department personnel is low and usually, these people cannot control the fear caused by the risk of coronavirus. The remarkable point in this study was that despite the low fear control score in these people, the response efficiency was relatively high in them. In general, the results showed that these six constructs explained 49.8% of the protective behaviors against COVID-19, in which the role of the perceived severity construct was stronger than other constructs.

Based on the results of linear regression model analysis in Sadeghi et al.'s[28] study, the constructs of protection motivation theory were able to predict 58.5% of the changes in protection motivation in bank employees, and the fear construct was considered the strongest predictor of protection motivation. According to the analysis of these researchers, this issue indicates that if a person is afraid of contracting COVID-19 and its complications, his motivation for preventive behaviors increases.[28]

In line with the results of the present study, in the study of Hosseini et al.,[29] the construct of vulnerability and perceived severity had a greater effect on predicting protective behavior than other constructs of the theory. In other research, the constructs of perceived severity and susceptibility have been emphasized as predictors of the motivation to perform protective behavior.[5,30,31]

In the study by Karimiankakolaki et al.[32] regarding the determinants of protective behavior against skin cancer based on EPPM, the construct of perceived severity had the highest score among the constructs of the model, which were consistent with the results of the present study.[33]

In the study of Motayerzadeh et al.,[33] all EPPM constructs had a significant relationship with preventive behaviors against COVID-19, and the constructs of perceived threat (perceived susceptibility and severity) and perceived self-efficacy were predictive factors of preventive behaviors.

These results show that the more a person's belief and attitude is that they can perform a protective behavior against COVID-19, the greater the intention to perform that behavior. Therefore, if people accept that they are sensitive to COVID-19 and may be harmed by it and their lives are threatened, they are more likely to perform preventive behaviors.

One of the limitations of this study is the use of an online questionnaire, which may lead to bias in the selection of samples. Another limitation of the present study is the possibility of changing the answers of the participants to be socially accepted. Since self-report data were used in this study, it is possible that, like other similar studies, the participants gave positive answers to the attitude

and behavior questions based on what they think is expected of them,[34] but Due to our limitation in using other questioning methods during the COVID-19 epidemic and the large sample size, these results can be somewhat reliable.

To accurately determine the effect of the constructs of the EPPM on the protective behaviors of the employees of the health department, it is suggested to design and implement intervention studies in this field with a larger sample size and on a wider scale. Also, based on the results, only 48.9% of the protective behaviors are predicted by the model constructs; Therefore, it is suggested that future studies focus on other effective factors as well as different cities.

5 | CONCLUSION

In this study, in examining the role of the constructs of the EPPM, it was found that there is a correlation between protective behaviors and the constructs of perceived severity, perceived susceptibility, self-efficacy, response efficiency, and risk control. Therefore, it is suggested that the results of this research be used in the development of training programs to improve protective behaviors in high-traffic offices, and by emphasizing the findings of the current research, the necessary training on the prevention of COVID-19 disease in the workplace should be provided. These results can be used to prevent future similar epidemics.

AUTHOR CONTRIBUTIONS

Marzieh Noroozi Masir: Conceptualization; data curation; resources; writing—original draft; writing—review & editing. **Mohammad Javad Tarrahi**: Conceptualization; formal analysis; methodology; project administration; software; supervision; writing—review & editing. **Zohreh Fathian Dastgerdi**: Conceptualization; methodology; supervision. **Majid Rahimi**: Conceptualization; methodology; project administration; supervision; validation; writing—original draft; writing—review & editing.

ACKNOWLEDGMENTS

We are deeply grateful to all the elderly people who helped us with this project. We thank Isfahan University of Medical Sciences for confirming this research. This research was done under the financial support of Isfahan University of Medical Sciences.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data related to this research is available in the Research Vice-Chancellor of Isfahan University of Medical Sciences.

ETHICS STATEMENT

The study was approved by the Ethics Committee of the Isfahan University of Medical Sciences. (MUI. RESEARCH. REC.1398.464.).

TRANSPARENCY STATEMENT

The lead author Majid Rahimi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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How to cite this article: Noroozi Masir M, Tarrahi MJ, Fathian Dastgerdi Z, Rahimi M. Investigating the factors related to protective behaviors against COVID-19 in healthcare workers: application of extended parallel process model. *Health Sci Rep*. 2023;6:e1778. doi:10.1002/hsr2.1778