

Original Article



# Influencing Factors of the Back Care-related Behavior Among Female Schoolchildren: A Structural Equation Modeling

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**Abstract**

**Background:** Back pain is one of the most important public health problems that is on the rise among the schoolchildren's population. The aim of this study was to determine cognitive factors related to back care-related behavior based on the social cognitive theory (SCT) among female schoolchildren.

**Methods:** A cross-sectional study was directed among 5th-grade female students through a convenience method. Structured questionnaire data were collected from 610 students attending public elementary schools in Tehran, Iran from October 2018 to March 2019. The initial model was formulated based on the SCT. Based on these data, the hypothesized model was confirmed via a structural equation modeling analysis using SPSS (version 24.0) and LISREL (version 8.80).

**Results:** The skills ( $r=0.73$ ,  $t\text{-value}=13.42$ ), self-efficacy ( $r=0.87$ ,  $t\text{-value}=15.51$ ), and expectation beliefs ( $r=0.61$ ,  $t\text{-value}=6.68$ ) were verified as key cognitive factors that cause a back behavior. Finally, various indicators such as comparative fit index, normed fit index, and root mean squared error of approximation demonstrated the fitness of the models ( $P<0.0001$ ).

**Conclusion:** The results showed that those schoolchildren having more self-efficacy, skills, and expectation beliefs are more likely to do proper back behavior. In this regard, school-based back pain prevention interventions should further focus on predefine key cognitive factors that consider the potential change strategies.

**Keywords:** Social cognitive theory, Back-care behavior, Schoolchildren, Structural equation modeling

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## Introduction

Back pain is an important public health problem and the leading cause of adult disability worldwide (1,2). This problem is on the rise among the adolescent and schoolchildren's population, and its prevalence rate varies between 11% and 52.1%. It is argued that back pain in the younger years is associated with back pain as an adult; however, it increases in both developed and developing countries (2-5). Behavioral risk factors for back pain in children are, among others, prolonged improper backpack loading during the childhood years, carrying the bag on one side of the body (1,5-7), physical inactivity (1,8), and improper posture during daily activities (7,9).

It is argued that back-care behavior among schoolchildren is a key outcome in the evaluation of back-care education programs (10). Developing an educational program with a suitable theory will enrich the program and make it effective. Many health education/promotion programs (11-13) have well documented considerations to the social cognitive theory (SCT). According to this theory, three

main psychological determinants predict any behavior changes, including self-efficacy (SE), behavioral capability (knowledge and skills to perform a given behavior), and outcome expectation beliefs or behavioral beliefs (14,15). Furthermore, back pain prevention programs in elementary schools are thought to help pupils to adopt healthy spine-related behaviors during daily activities that lead to lower health care costs and enhance the quality of life (1).

However, to the best of our knowledge, this theory has not been used in any particularly back pain prevention programs in elementary schools, and no research has so far applied a theoretical structure model that explores influencing factors causing back behaviors. Considering that obtaining factors contributing to back-care behaviors among schoolchildren is crucial for designing and implementing proper interventional programs, this study focused on investigating these factors among pupil populations attending elementary schools.



## Materials and Methods

The objective of this study was to build a structural equation model (SEM), including cognitive factors relevant to pupils' healthy back-related behaviors based on the SCT. It also aimed to confirm our model through the goodness of fit using actual data.

This study used a cross-sectional design among 5th-grade students attending elementary schools in Tehran, Iran from October 2018 to March 2019. The finding showed that the prevalence of back pain enhanced with age; in fact, a sharp rise was found in rates from childhood to adolescence. There is a borderline at approximately 11 years (4,13). We only discuss the cognitive aspect for back-care behavior measurements rather than the environmental aspect. The authors employing latent variables and the SEM can investigate information about the coexistent causal relationship between the applied constructs. The SEM can also provide information about the factor load and measurement error. The model's goodness of fit was used to test hypothetical paths.

This section reveals the formation of the initial model of the structural equation before making the consideration. This initial model was formulated based on the SCT (Figure 1). According to the literature, the analysis will not start until the researcher indicates a conceptual framework that demonstrates the relationship between the variables for analysis (16).

Considering that a higher prevalence was reported in girls compared to boys (4,13), participant selection criteria included female students aged 11 years, an agreement for their participation by their school principal, parents' informed consent, and a willingness to participate in the study. There is no specific standard for selecting the sample size in the SEM, but it is still generally true that the SEM is a large sample technique (17). However, the suggested sample size is 200 and higher. For this reason, it was decided to select a sample of 610 (out of 805) participants. The subjects were female schoolchildren aged 11 years. They were in grades 5 attending eight public elementary schools in district 22 where the district represents a population with a variety of socio-economic backgrounds.

The demographic characterize questionnaire includes

the parents' job and level of education, birth ranking, and two questions about the presence of back pain during the last week (Yes & No). The Back-care Behavior Assessment Questionnaire was used to measure the main variables. The validity and reliability of this questionnaire were tested, and the results represented good test-retest stability; the intraclass correlation and Cronbach's alpha coefficients were 0.84 and 0.93, respectively (18).

**Back-care skills:** It is a checklist for the practical assessment of skills for back-care principles. The test was also based on the measure developed by Cardon et al (19). The intra-class correlation coefficient in their study ranged from 0.79 to 0.98. The test consisted of seven tasks, including sitting at a table, picking up the crate, carrying the crate, setting the crate down on the table, picking up a pencil, moving the crate, and booking bag use. The checklist contained 23 items, and each item was rated on a 3-point scale ranging from 0 (not fulfilling the criteria) to 2 (correct completion of the task) giving scores ranging from 0 to 46 points where higher scores indicate better fulfillment of tasks.

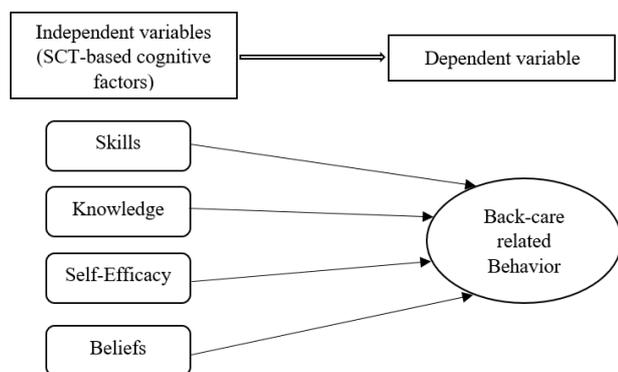
**Back-care knowledge:** The knowledge was measured using 10 multiple-choice questions and the pass/fail scoring procedure. Scores on this variable range from 0 to 10, where the higher scores obtain higher knowledge. This self-reported questionnaire assesses specific and general back-care knowledge.

**SE:** SE towards correct back-care behavior was assessed by asking 4 questions on how easy or difficult was participation in physical activities and sports each day, the natural curvature of the spine, minimal loading of the book bag, and attention to agronomical postures. Each item is rated on a 4-point scale (from difficult to easy) yielding scores from 4 to 16, and higher scores indicate higher SE.

**Expectation beliefs:** Outcome expectation beliefs containing 6 items asking whether sitting, swimming, running, participating in physical education, cycling, and lifting heavy objects are 'dangerous' when having a backache. Each item is rated on a 5-point scale (strongly disagree to strongly agree) giving scores ranging from 6 to 30 where higher scores represent stronger beliefs.

**Back-care behavior:** The healthy spine-related behavior was assessed through 6 questions regarding daily activities, including checking the weight of the book bag, carrying the bag with 2 straps, checking the knee position when putting on shoes, doing exercises every day, and having postural behaviors while lifting and carrying objects. These questions were rated on a 5-point scale (from never to ever). Response categories ranged from never (1) to ever (5) giving a score ranging from 6 to 30 where higher scores demonstrate a better preventive behavior.

Before data collection, the aim of this study was explained to the principal, class teacher, and pupils. The questionnaires were distributed among them after obtaining their permission. Two independent research assistants helped in this study and rated students' skills based on the checklist. Given that the analysis of the



**Figure 1.** Conceptual Framework of the Study. Note. SCT: Social cognitive theory.

path of the relationship between the variables is worthy of attention, it was attempted to identify whether the relationships between variables extracted from the theory are confirmed by the collected data from the sample.

The data were analyzed using SPSS software (version 24) and LISREL 8.80 to test the correlation between study variables, the significance of item loadings on each relating factor, and the coefficients of the structural model; the level of significance was obtained at  $P < 0.05$ . Descriptive statistics were used to analyze students' common characteristics. Furthermore, a suitability test between model and data was performed through several fit indices with recommended cut-points. The indices included Chi-square to the degrees of freedom ratio ( $\chi^2/df$  values between 1 and 5 verify a good model fit), the comparative fit index, normed fit index (CFI and NFI  $\geq 0.95$  indicate a good model fit), the goodness of fit index (GFI  $\geq 0.90$  implies a good model fit), and root mean squared error of approximation (RMSEA  $\leq 0.05$  represents a very good fit,  $> 0.05$  and  $\leq 0.01$  acceptable fit) (20-22).

**Results**

Overall, 610 schoolchildren aged 11 years participated in this study. As regards the common characteristics of the students, 79.4% of their fathers (n = 487) and 82.1% of their mothers (n = 501) had secondary and higher education, respectively, and 23.6% of them (n = 144) reported back pain during the last week. The general characteristics of the participants are provided in Table 1.

To verify the hypothesized model, first, the fit and validity of the instrument were tested using CFA. The goodness-of-fit indices were the  $\chi^2$  value at 3921.78, degrees of freedom of 1117, which yielded a ratio  $\chi^2/df = 3.51$ . The values of the CFI, GFI, and NFI were 0.97, 0.92, and 0.96, respectively ( $P < 0.0001$ ). With regard to the RMSEA, the value was 0.091. All indices fitted the recommended level, except for the  $\chi^2/df$  value (Table 2). Figure 2 shows the factor weighting values for the total variables.

The standardized coefficient measurement model shows a positive correlation between the latent variables and their corresponding items. In fact, the standardized coefficients represent the path coefficients or standardized load factors between items and variables. In the SEM analysis, a positive and significant correlation exists between the construct and its corresponding items (Figure 2).

Based on Figures 2 and 3, the results of the SEM analysis confirmed the effect of independent variables (skills, knowledge, SE, and beliefs) on the dependent variable (behavior). As shown, the effect of skills, knowledge, SE and beliefs on behavior is 0.73 (t-value = 13.42), 0.03 (t-value = 1.482), 0.87 (t-value = 15.51), and 0.61 (t-value = 6.68), respectively.

Based on the obtained data, the confirmation path analysis of four constructs was verified according to path standard coefficients and significant values. The existing relationships based on the SCT and collected data from the sample at a significance level of  $\alpha = 0.05$ , if the t-value

**Table 1.** General Characteristic of the Participants (N=610)

	Frequency	Percent
<b>Father's job</b>		
Employed	564	92.4
Unemployed	4	0.7
Retired	28	4.6
Missing	14	2.3
<b>Mother's job</b>		
Employed	123	20.2
Housewife	480	78.7
Missing	7	1.1
<b>Father's level of education</b>		
Illiterate/primary	61	10.0
Secondary	204	33.4
Higher	248	40.7
Missing	97	15.9
<b>Mother's level of education</b>		
Illiterate/primary	79	13.0
Secondary	235	38.5
Higher	216	35.4
Missing	80	13.1
<b>Presence of back pain</b>		
Yes	144	23.6
No	459	75.2
Missing	7	1.1

**Table 2.** Fitness Indicators of the Hypothesized Model

CFI	RMSEA	GFI	NFI	P-value	$\chi^2/df$	Results
0.97	0.091	0.92	0.96	<0.000	3.51	Verified

Note. CFI: Comparative fit index; RMSEA: Root mean square error of approximation; GFI: Goodness of fit index; NFI: Normed fit index. Statistical significance at  $P < 0.05$ .

between variables is greater than 1.96, are as follows:

- There is a significant and direct relationship between skills and behavior.
- There is no significant relationship between knowledge and behavior.
- There is a significant and direct relationship between SE and behavior.
- There is a significant and direct relationship between expectation beliefs and behavior.
- There is no significant relationship between independent variables.

**Discussion**

The path analysis technique is one of the statistical methods that is mostly used to test causative models, thus it is considered for testing confirmation theories. In fact, in the path analysis, the relationship between variables is worthy of attention. The goodness of fit of the hypothetical model (based on the SCT) and actual data was validated, and the result revealed the causal relationship and relative

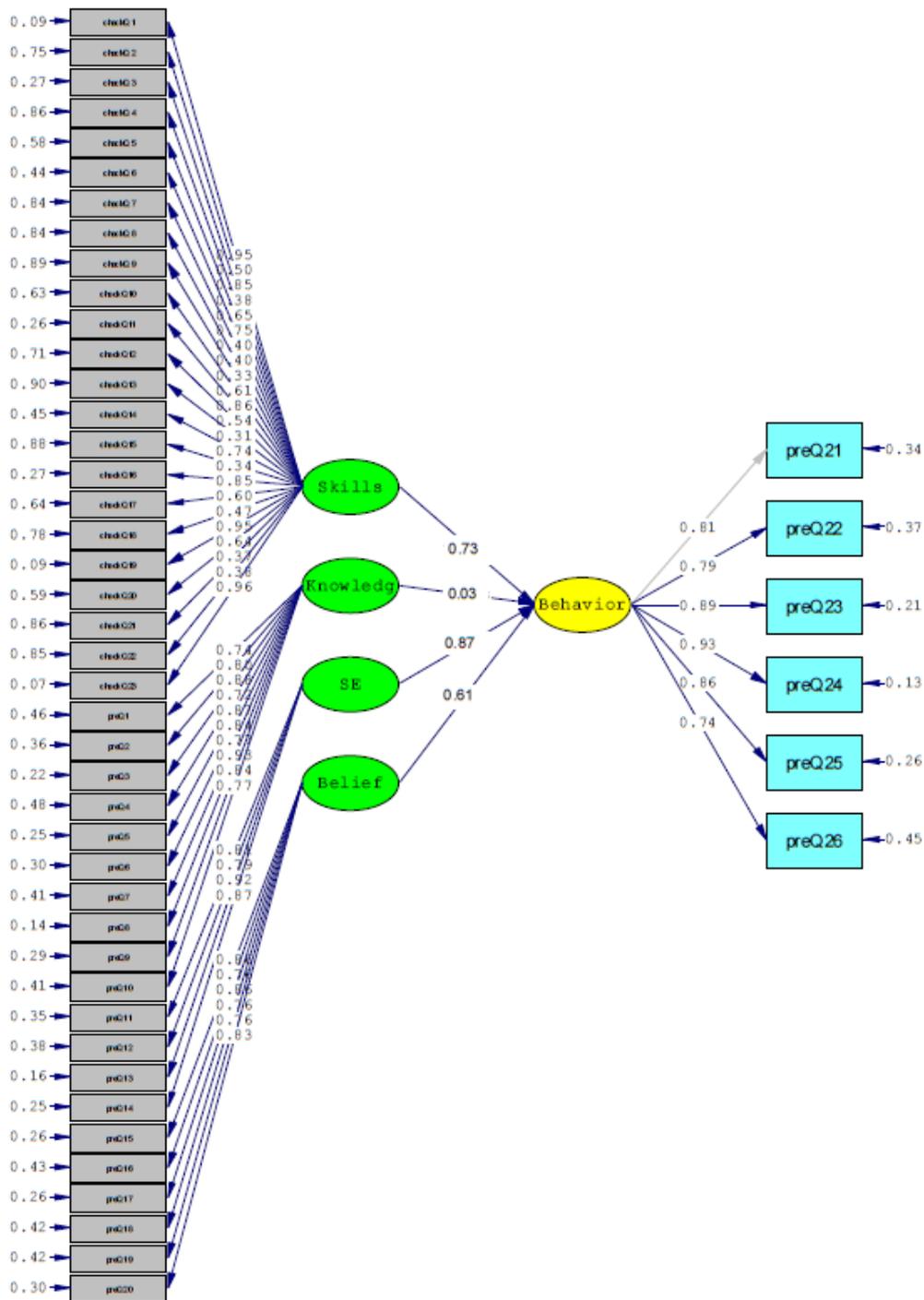


Figure 2. Path Diagram Model With Standardized Parameter Values.

importance of variables affecting pupils’ back-care behavior.

Based on the path diagram, the findings of this study showed that the SE, skills, and expectation beliefs were important mediators of back-care behavior. Based on previous reports, SE affects the initiation and continuance of back behavior (10,23). According to evidence (15), SE toward proper back behavior consisted of both individual characteristics (emotional states and mastery experience) and external factors (social modeling and vicarious reinforcement). The direct relationship between SE and behavior indicates that it may be due to the strong pupil-

judgment of behavior in relation to back care. Hall et al (11) demonstrated that SE and behaviors had a positive correlation. This direct relationship may indicate that the back-pain prevention program should be implemented for modelling, feedback, and reattribution sufficiently since these factors are important for improving self-efficacy in health-related behavior (10,23).

A positive value on the coefficient’s expectation beliefs implies that the stronger beliefs of the schoolchildren about dangers of back pain lead to better healthy back behavior of children. These results are in agreement with those of Gross et al (23), demonstrating that one of the most

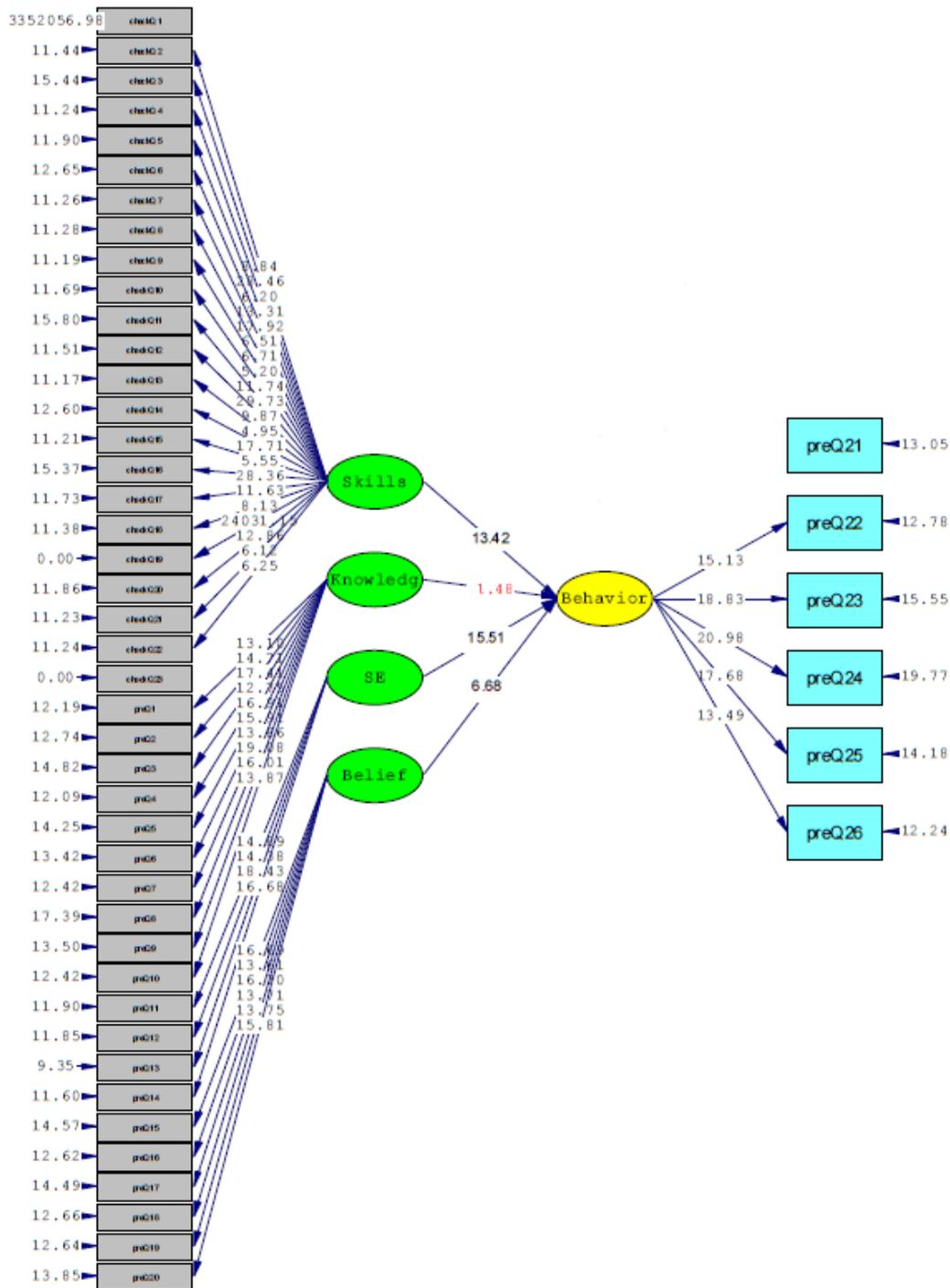


Figure 3. Path Diagram of a Structural Model With t-value Estimates.

basic assumptions about human behavior was that what people’s beliefs guide their actions; therefore, to enhance proper back behavior, we must reinforce the proper beliefs and active approach of focusing on pain (10) that were predictive. In fact, a change in belief is easier at a young age; accordingly, appropriate actions should be considered in the educational program to correct it. According to these results, potential change strategies for promoting expectation beliefs should be considered in back-care intervention programs.

In this study, a significant and positive relationship was found between skills and back-related behavior ( $P < 0.0001$ ),

and this result has been not reported previously. However, this indicates that we might be able to promote students’ proper back-related behavior by improving their skills. As suggested in educational initiatives, we need to target children’s skills toward back-related behavior during key constructive years when maladaptive beliefs, habits, and attitudes about the condition are being shaped (23).

The knowledge of back principals was not supported in this model. In their study Dullien et al reported that back-care knowledge and parts of back-care behavior could be significantly improved from pre- to post-test (1); in other words, the increase in the intervention group’s knowledge

did not significantly affect their behavior. Hall et al (11) also concluded that knowledge was not associated with SE ( $r=0.02$ ,  $P=0.88$ ) or behavior ( $r=0.14$ ,  $P=0.23$ ).

Similarly, Dos Santos et al (24) found no statistically significant difference between the post-test and follow-up concerning the back-care knowledge. However, the performance of students was higher in the post-test and follow-up when compared with the pretest. Although their behavior was better, knowledge represented no change, implying that there was no relationship between knowledge and performance. Perhaps this is because people usually do not act based on their knowledge.

Nonetheless, we believe that knowledge has a key role in changing behavior, and improper habits are caused by a lack of awareness or knowledge about back-care principles; however, its effects may vary depending on the context in which it is given. Contrarily, according to the literature, education alone is unlikely to promote positive and persisting behavioral changes without coincident strategies (23). Finally, the implication of this study is the importance of considering public health as a power factor so that children can have healthy back-related behavior.

However, this study had some limitations. First, we used a cross-sectional design, and data were collected through self-reported measures and raters' assessments; for this reason, we cannot verify the relationship between the measured factors. Longitudinal data and experimental studies are needed to evaluate the obtained results in this study. Second, although we explored the main cognitive factors of behavior in order to decrease the questions' burden on participants, we acknowledge that there were other factors based on the SCT (the environmental determinants of behavior) that were not adequately addressed in this study. Eventually, the potential concern is that data were collected from the girls' population attending public elementary schools, therefore, we cannot fully assure the generalizability of results to the overall population.

## Conclusion

In this study, we proposed to test the hypothesized model and confirm the relevant paths. The hypothesized model of this study demonstrated well fit to the data. Moreover, 3 of 4 hypothesized paths were significant. The study results showed that schoolchildren with more SE, skills, and expectation beliefs are more likely to do proper back behavior. In our research, the focus of attention was on providing evidence for developing potential change strategies targeting school-based back pain prevention interventions.

Our study suggests the utility of the main cognitive determinants of the SCT for further research examining children's back behavior. SCT-based back-care education programs should further focus on SE, skills, and expectation beliefs to plan actions, and it is suggested that more randomized community trial studies be conducted in this regard.

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## Authors' Contribution

ZAC was the main investigator, who collected and analyzed the data and wrote the first draft. She took responsibility for conducting the study and the integrity of the data and the accuracy of the data collection. SST conducted the whole study, and supervised and contributed to all aspects of the study. SST, ZAC, and AM had a partnership in this study. All authors read and approved the final manuscript.

## Conflict of Interests

Authors declare that they have no conflict of interests.

## Ethical Permissions

The study was approved by the Ethics Committee of Tarbiat Modares University (under the code IR.TMU.REC.1396.727) and was in accordance with the Helsinki Declaration. We invited all the available students who had been approved for participation by their school principal, and their parents, and informed them about the research design, and objectives, as well as voluntariness, confidentiality, and their rights. They then agreed to participate in the study by completing and returning the questionnaire. The parents completed the written consent form.

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