The association between back pain, individual determinants, and posture habits among schoolchildren in Iran

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Abstract. Back pain is considered as a public health problem and it may be predictive of adult disability, and is on the rise among the schoolchildren population. The aim of this study was to explore the association between back pain, posture habits and individual factors (knowledge, self-efficacy, beliefs, and behavior) among schoolchildren. A self-reported questionnaire was used to collect the demographics characteristics, individual factors, posture habits, and back pain. Chi-square test and binary logistic regression analyses were used to examine the association between variables. Among 610 pupils, the prevalence of back pain was 23.6% (n = 144). There were 530 (86.9%) pupils that indicated that they had carried the school backpack of ideal posture. There were significant relationships between the sitting at work on the computer (p = 0.006, OR = 1.66, 95% CI = 1.11-2.49) and on a chair (p = 0.021, OR = 1.61, 95% CI = 1.01 - 2.57) habits with back pain respectively. Self-efficacy significantly associated with back pain (p = 0.001). Similarly, individual factors significantly associated with posture habits. The findings suggest that back care educational programmes are needed to address individual factors in order to promote proper posture habits and reduce backache.

Keywords: Back pain, posture habits, schoolchildren, individual determinants, Iran.

INTRODUCTION

Back pain is considered as a public health problem, and it may predict adult disability (Amyra *et al.*, 2018; Dullien *et al.*, 2018). In 2015, based on WHO global burden of disease report, back pain, such as low back pain (LBP) and neck pain were ranked numbers 1 and 4 respectively, among all acute and chronic diseases and injuries in 188 countries for years lived with disability (Kamper *et al.*, 2016). In addition, back pain in early years should be noted as a contributory factor for back pain in adulthood (Dianat *et al.*, 2018; Kamper *et al.*, 2017; Khanzada *et al.*, 2016). Recent studies have also indicated that neck and low back pain as major causes of disability in school children and adolescents (Kamper *et al.*, 2017; Khanzada et al., 2016).

The life time prevalence estimates of back pain in children and youth vary from 7 to 74% (Dianat *et al.*, 2017; Khanzada *et al.*, 2016), and compare to boys, higher prevalence and incidence in adolescent girls are reported (38.9% in girls vs. 35.0% in boys). Evidence suggests that prevalence of back pain increases with age where it is 27.4% in 11-year-olds, 37.0% in 13-year-olds, 46.7% in 15-year-olds; (Kamper *et al.*, 2016; Maher *et al.*, 2017). In Iran, a recent study demonstrated that the prevalence of low back pain among girls and boys was 39 and 29%, respectively (Dianat *et al.*, 2017). A warning finding by an Iranian study demonstrated an 86% prevalence of back pain among 307 primary schoolchildren at the ages between 7 and 12 years

(Janakiraman *et al.*, 2017).

There are many investigations on risk factors for back pain in children. Recently, Nichele *et al.* (2017) assessed the behavior of postural variables and the associated factors, such as back pain and life habits, in pupils during a period of four years. The results showed a high prevalence of poor sitting posture in boys (72.2 to 89.5%) and girls (73.3 to 100%). In addition, females had poor posture due to the way they carried their backpack. As systematic reviews of cohort studies (Maher *et al.*, 2017) reported that the lifting habits (both the weight of the load and the number of lifts) and lifestyle determinants (example smoking, obesity, and depressive symptoms) were risk factors that lead to back pain. The results obtained by Aprile *et al.* (2016) indicated that the backpack weight had a weak impact on back pain, however, the backpack carrying time was a strong predictor variable; whereas, other factors (anatomical, physiological, or environmental) might play an important role in pain perception. Similarly, Kamper *et al.* (2017) observed that psychosocial stress as well as other psychosocial factors increases the risk of back pain and girls have a higher risk than boys. As reported by Geldhof *et al.* (2007), the back-care education through the elementary school curriculum was effective in back pain prevention till adolescence. In addition, Franz *et al.* (2014) suggested that knowledge about the back pain risk factors in childhood might lead to early back-pain prevention.

Although many researchers have studied prevalence and risk factors of back pain among school age children, however, to the authors' best knowledge, very few publications are available that address the association between posture habits with back pain and individual determinants with back pain and posture habits. Healthy back behavior during daily activity among children was a key outcome in the evaluation of back care education intervention's effectiveness (Dolphens *et al.*, 2011). According to the social cognition models (SCMs) and Social Cognitive Theory (SCT) main individual determinants are: knowledge; self-efficacy (SE); beliefs; and behavior (Conner and Norman, 2005; Glanz *et al.*, 2008). In fact, these theories contain those constructs that engage individuals with a given behavior. Thus, the present study aimed to assess the relationship between: a) posture habits with back pain; and b) individual factors with posture habits and back pain among schoolchildren.

Research hypothesis

There was relationship between: (a) posture habits with back pain and (b) individual factors with posture habits and back pain among schoolchildren.

The remainder of paper is organized as follows: (a) the Materials and Methods are describing in section II; (b) section III is devoted to the Results; (c) the Discussion presents in section IV; and (d) section V draws the Conclusion.

MATERIALS AND METHODS

Study population and procedure

This was a cross-sectional study to investigate influencing factors of back pain. The study was conducted between October 2018 to May 2019, in district 22 (the name of the district), located in the North-western region of Tehran, Iran. We chose this area because it represents a population with a variety of socio-economic background. Since the kind of our research was descriptive, to select the sample, convenience sampling method was used for the study. The subjects were 610 of 805 female school children aged 11 years, in grades 5 attending at eight public elementary schools.

Data collection

The data were collected using a self-reported questionnaire consisting of demographic characterizes and back care knowledge, self-efficacy towards proper back care behaviour, fear-avoidance beliefs, and behaviour, which represented good test–retest stability (Cardon *et al.*, 2002) and had been used in previous research (Cardon *et al.*, 2002; Dolphens *et al.*, 2011). The demographic variables included information on pupils' parents job and level of education and a question about the presence of back pain during last week among pupils (Yes, No) (Cardon *et al.*, 2002; Dolphens *et al.*, 2011). Body Posture Evaluation Instrument [BackPEI images] according to Noll *et al.* (2013) was used to identify the different active postures, and were classified as ideal posture and not ideal posture (Figure 1) (Desouzart, 2017). In addition, Figure 2 shows relationship between the variables.

Statistical analyses

Data were analyzed using SPSS, 24.0 version. Frequency and percentage were computed for categorical variables; and the quantitative variables' descriptive statistic is shown by mean and standard deviation.

The demographic data and posture habits were first analyzed using crosstabs and chi-square tests to broadly assess the data related to the presence of back pain. Since dependent variables had two level, binary logistic regression was used to show which quantitative variables associated with the presence of back pain and posture habits. Factors entered into regression models included knowledge, self-efficacy, beliefs, and behaviour. In all
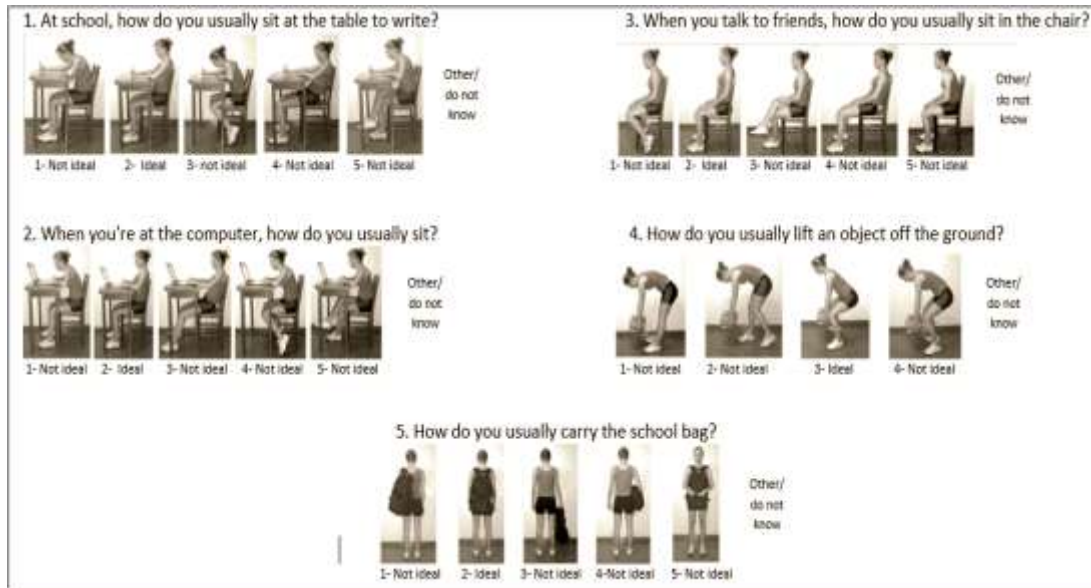
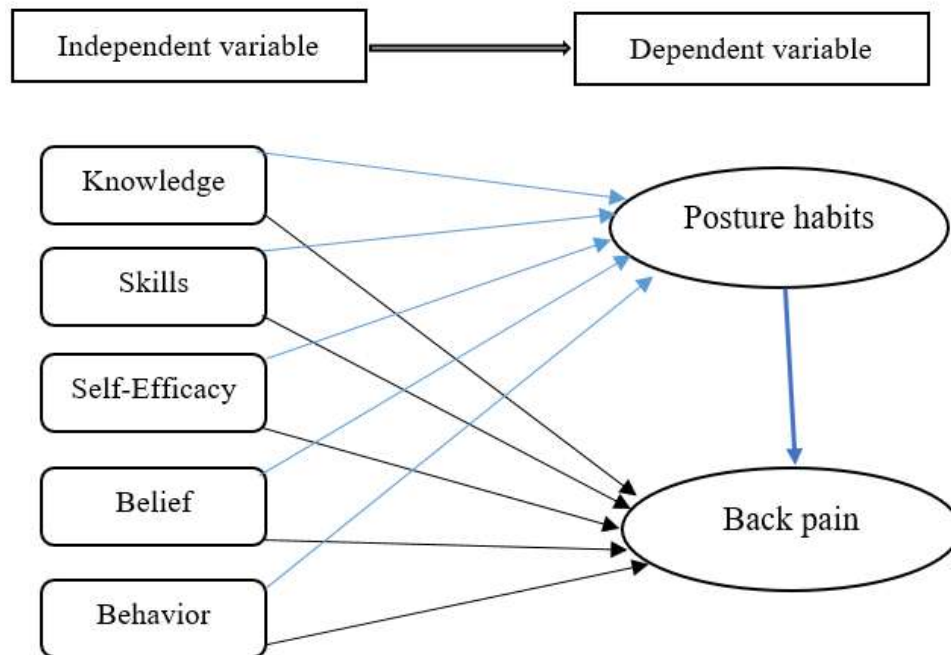**Figure 1.** Ideal and not ideal postures (Desouzart and Gagulic, 2017: 2).

Figure 2. Relationship between dependent and independent variables.

tests, the level of significance was obtained at p < .05.

RESULTS

Among a possible pool of 805 5th-grade female school children, a total of 610 pupils attending school on the day of research administration participated in the study (response rate = 88%). Among the subjects who experience the measurements, 79.4% of their father (n = 487) and 82.1% of their mother (n = 501) had secondary and higher education, respectively. Regarding the presence of back pain in the participants, about a quarter of them (n= 144), reported back pain during last week. Frequency and percentage of the demographic characteristics and postural habits of the participants are shown in the Table 1. Likewise, the mean with standard deviation of the quantitative variables scores are

Table 1. Basic characteristics and postural habits of pupils (n = 610).

	Frequency	Percent
Father's job		
Employed	564	92.5
Unemployed	4	0.7
Retired	28	4.6
Mother's job		
Employed	123	20.2
Housewife	480	78.7
Father's level of education		
Illiterate/primary	29	4.8
Secondary	239	38.7
Higher	248	40.7
Mother's level of education		
Illiterate/primary	29	4.8
Secondary	285	46.7
Higher	216	35.4
Presence of back pain		
Yes	144	23.6
No	459	75.2
At school. sitting at the table to write		
Not ideal	410	67.2
Ideal	170	27.9
Sitting at work on the computer		
Not ideal	353	57.9
Ideal	224	36.7
Sitting on a chair or bench to chat with friends		
Not ideal	450	73.8
Ideal	148	24.3
Lift an object off the ground		
Not ideal	477	78.2
Ideal	117	19.2
Carrying the school backpack		
Not ideal	55	9
Ideal	530	86.9

demonstrated in the Table 2.

Relationship between the variables

Chi-square test demonstrated significant relationship between 'sitting at work on the computer' (p = 0.006, OR = 1.66, 95% CI = 1.11-2.49) and 'sitting on a chair or bench to chat with friends' (p = 0.021, OR = 1.61, 95% CI = 1.01-2.57) habits with the presence of back pain (Figure 3). There was not significant difference between demographic characteristics and other posture habits with the presence of back pain among the pupils (Table 3).

Table 2. Descriptive statistics for the quantitative variables (n = 610).

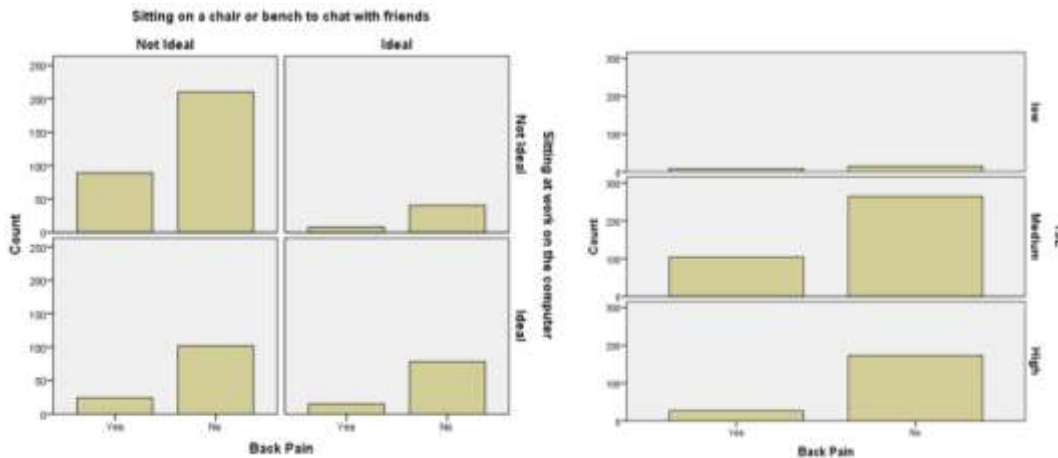|	Mean	SD	Score range
Knowledge	4.56	1.44	0-10
Self-efficacy	11.74	3.05	4-16
Belief	20.43	4.84	6-30
Back care behavior	21.89	5.22	6-30

Figure 3. Relationship between back pain with sitting habits and self-efficacy (SE).

In total, 4 independent quantitative factors including knowledge, self-efficacy, beliefs, and back behaviour were tested using univariate binary logistic regression to identify significant factors related to back pain and posture habits. The only factor that significantly associated with back pain in univariate analyses included self-efficacy (χ^2 = 29.66, p = 0.001) (Figure 3). In the other hand, the final model containing one factor was statistically significant indicating that the model was able to distinguish between pupils who did and did not have back pain (Table 4).

The proposed factors were then tested to identify significant factors associated with posture habits. This study of 610 pupils identified: a) the 3 factors that significantly affect 'at school, sitting at the table to write' habit (χ^2 = 39.01, p < 0.0001); b) the 3 factors were significantly associated with 'sitting at work on the computer' habit (χ^2 = 35.27, p < 0.0001); c) the 1 factor was statistically significant related to 'sitting on a chair or bench to chat with friends' habit (χ^2 = 28.76, p < 0.0001); and d) all of the 4 factors were significantly associated with 'carrying the school backpack' habit (χ^2 =b21.15, p < 0.0001) respectively. Although, one of the final models indicates that it is not able to distinguish between pupils with and without ideal posture when 'lifting an object off the ground' (χ^2 = 8.92, p = 0.063). Table 5 presents results for the associations between the proposed factors with posture habits. The proposed quantitative factors in the final models demonstrated standard errors (S.E) lower than 2.0 suggesting that there were no problems with multi-collinearity.

DISCUSSION

This study aimed to demonstrate the relationship between individual determinants and posture habits with back pain; as well as between individual determinants with posture habits among subjects. This relationship has not been previously assessed among the pupils.

The results of this study showed that back pain was common among the 11 years old female students in district 22 of Tehran, Iran. It is noteworthy that 23.6% (n=144) of the pupils in the current study reported feeling back pain in the last week. This result is relatively comparable to reported prevalence rates (Dullien *et al.*, 2018).

One of the most frequent ideal factors of postural habits is 'carrying the school backpack', 86.9% of the children indicated using a backpack with support at both shoulders, consistent with finding of Desouzart *et al.* (2017). Only 24.9% (n = 152) of respondents identified the maximum weight of book bag correctly. However, even when the backpack is used properly, if the weight of the backpack greater than 15% of total body weight it can influence posture and cause back pain specifically among the children and adolescents (Amyra *et al.*, 2018; Desouzart, 2017).

Regarding risk posture habits for back pain in the last week, the significant factors were: sitting posture at work

Table 3. Presence of back pain by basic characteristics and posture habits (n = 610).

Characteristics	Presence of back pain N (%)		Chi-square value	P-value
	Yes	**No**		
Father's job				
Employed	134 (95)	424 (94.4)		
Unemployed	1 (0.7)	3(0.7)	0.161	0.95
Retired	6 (4.3)	22(4.9)		
Mother's job				
Employed	30 (21.0)	93 (20.4)	4.538	0.72
Housewife	113 (79.0)	361 (79.2)		
Father's level of education				
Illiterate/primary	11 (9.2)	17 (4.4)		
Secondary	50 (42.0)	184 (47.2)	5.613	0.10
Higher	58 (48.7)	189 (48.5)		
Mother's level of education				
Illiterate/primary	9 (7.1)	19 (4.8)		
Secondary	72 (57.1)	210 (52.5)	3.929	0.27
Higher	45 (35.7)	171 (42.8)		
At school. sitting at the table to write				
Not ideal	102 (73.9)	306 (70.2)	1.143	0.40
Ideal	36 (26.1)	130 (29.8)		
Sitting at work on the computer				
Not ideal	98 (71.5)	253 (58.3)	8.441	0.006*
Ideal	39 (28.5)	181 (41.7)		
Sitting on a chair or bench to chat with friends				
Not ideal	116 (82.9)	331 (73.2)	5.745	0.021*
Ideal	24 (17.1)	121 (26.8)		
Lift an object off the ground				
Not ideal	117 (83.6)	355 (79.2)	1.536	0.26
Ideal	23 (16.4)	93 (20.8)		
Carrying the school backpack				
Not ideal	17 (12.2)	38 (8.6)	1.674	0.20
Ideal	122 (87.8)	402 (91.4)		

* Chi-square test, significant at < 0.05.

on the computer (P = 0.006) and on a chair or bench to chat with friends (P = 0.021). Supporting previous work (Mohammed, 2017; Yue *et al.*, 2012), sitting posture for a long period is an important factor that leads to back pain among the teachers and students. It is notable that in our study, 67.9% (n = 414) of pupils did not know that 'sitting' is the hardest position for back.

Some individual factors and posture habits were not related to back pain. Though, the relationship between lifting an object off the ground and carrying the school backpack with back pain was not significant, which is in agreement with previous studies' findings (Kamper *et al.*, 2016; Kamper *et al.*, 2017). There is a need for more studies on this issue and among greater samples. Only 48.4% (n = 295) of respondents correctly identified that when picking up a heavy box, they should bend their

Table 4. Significant factors of back pain.

Independent variable	B	S.E.	Wald	df	P-value	Exp (B)	95% C.I.for EXP (B)	
							Lower	Upper
Knowledge	0.023	0.070	0.104	1	0.747	1.023	0.892	1.173
Self-efficacy	0.156	0.038	17.304	1	<0.001*	1.169	1.086	1.258
Belief	0.021	0.022	0.960	1	0.327	1.021	0.979	1.065
Behavior	0.030	0.021	1.999	1	0.157	1.030	0.989	1.074
Constant	-1.827	0.720	6.434	1	0.011	0.161		

* Binary logistic regression, significant at < 0.05
B: Partial logistic regression coefficients
S.E: Standard errors of the partial slope coefficients
Exp: Slope coefficient

knees. Regarding the likelihood that having knee position when lifting, only 38.9% (n = 237) of the students said that they always did it. Although, 57.0% (n = 348) strongly agreed that when having a back pain, lifting heavy objects is dangerous.

Nevertheless, some results were remarkable, for instance all of 4 independent quantitative factors significantly associated with the 'carrying the school backpack' habit. 95.1% (n = 580) of respondents correctly identified the best way to carry a book bag. However, 66.8% (n = 408) were confident, overall, regarding their ability to endure book bag weight. Similarly, 71.5% (n = 439) of the students reported that they always carried the bag with 2 straps. In addition, knowledge significantly associated with the 'At school sitting at the table to write' habit [Exp(B) = 0.861, p = 0.03]. This however, indicates that with improving students' knowledge, as well as self-efficacy, we might be able to promote their proper at school sitting habit.

These findings suggest that students with higher self-efficacy were more likely to report having no back pain during last week. In addition, students who performed better on questions of knowledge, self-efficacy, beliefs, and proper back behavior, were more likely to indicate ideal posture habits. However, future studies should examine these findings qualitatively. The results of this study indicate that health educators should focus on back pain prevention education in order to address these factors and to improve community health.

This study has several limitations. First, data collection instrument was self-reporting, which may have accompanied by some bias. Second, as cross-sectional research, only relationships can be established but no assumptions of causality can be made. However, future studies (longitudinal data and experimental studies) are needed to evaluate the results observed in this study. Furthermore, pupils were selected from a purposeful sample that was fairly homogenous, comprising mostly students attending a public school in a specific district of capital Tehran; thus, generalizability of study results to the overall pupils may be controversial. Finally, the absence of an objective quantitative assessment of the real pain and the posture is a limit. However, due to practical limitations, we could not use objective measures. Although self-reported instruments are suitable tools in these types of studies due to their ease of application, low cost and the fact that they provide the opportunity for participants to self-report (Noll *et al.*, 2013).

CONCLUSION

This is the first study to assess the relationship between individual determinants according to social cognition models (SCMs) and posture habits with back pain; and between individual determinants with posture habits in pre-adolescent children. The findings show that the prevalence of back pain among participants is high and comparable to previous studies. Self-efficacy and sitting habits were important associations of back pain. Likewise, some individual factors significantly related to posture habits. Therefore, the findings suggest that back care educational programmes are needed to address these factors in order to promote proper posture habits and reduce back pain in participants. In addition, the focus of attention was on providing evidence for developing potential change strategies targeting school-based back pain prevention interventions.

Practical implication

Health educators can use this finding to prevent female schoolchildren back pain and promote proper posture habits by applying effective techniques and strategies.

ACKNOWLEDGEMENTS

Table 5. Significant factors of posture habits.

Independent variable	B	S.E.	Wald	df	P-value	Exp (B)	95% C.I.for EXP (B)	
							Lower	Upper
At school. sitting at the table to write								
Knowledge	-0.149	0.069	4.730	1	0.030*	0.861	0.753	0.985
Self-efficacy	0.207	0.038	30.237	1	<0.001*	1.230	1.143	1.325
Belief	0.018	0.019	0.856	1	0.355	0.982	0.946	1.020
Behavior	0.100	0.022	21.283	1	<0.001*	1.105	1.059	1.153
Constant	2.380	0.684	12.111	1	0.001	0.093		
Sitting at work on the computer								
Knowledge	0.090	0.064	2.020	1	0.017*	0.914	0.807	1.035
Self-efficacy	0. 190	0.034	30.359	1	<0.001*	1.209	1.130	1.293
Belief	0.005	0.018	0.070	1	0.547	1.005	0.969	1.042
Behavior	0.092	0.020	21.363	1	0.002*	1.096	1.054	1.139
Constant	2.426	0.636	14.557	1	<0.001	0.088		
Sitting on a chair or bench to chat with friends								
Knowledge	0.061	0.070	0.739	1	0.39	0.941	0.820	1.081
Self-efficacy	0.195	0.039	25.185	1	<0.001*	1.216	1.126	1.312
Belief	0.002	0.020	0.013	1	0.91	0.998	0.959	1.038
Behavior	0.073	0.021	12.478	1	<0.001*	1.076	1.033	1.120
Constant	3.194	0.717	19.816	1	<0.001	0.041		
Lift an object off the ground								
Knowledge	0.043	0.074	0.343	1	0.558	1.044	0.904	1.206
Self-efficacy	0.075	0.038	3.822	1	0.051*	1.078	1.000	1.162
Belief	0.022	0.022	0.988	1	0.320	1.022	0.979	1.067
Behavior	0.072	0.023	10.024	1	0.002 *	1.074	1.028	1.123
Constant	2.937	0.740	15.744	1	<0.001	0.053		
Carrying the school backpack								
Knowledge	0.219	0.104	4.493	1	0.034*	1.245	1.017	1.526
Self-efficacy	0.167	0.048	12.005	1	0.001*	1.181	1.075	1.298
Belief	0.069	0.031	4.926	1	0.026*	1.071	1.008	1.139
Behavior	0.097	0.025	15.457	1	<0.001*	1.102	1.050	1.156
Constant	2.011	0.968	4.320	1	0.038	0.134		

* Binary logistic regression, significant at <0.05
B: Partial logistic regression coefficients
S.E: Standard errors of the partial slope coefficients
Exp: Slope coefficient

REFERENCES

Amyra A, Ahmad A, Kamaruddin M, Nor S, Ima-nirwana S, Chin K (2018). The association between backpack use and low back pain among pre-university students : A pilot study. J. Taibah Univers. Med.

Sci. 13(2):205-209. https://doi.org/10.1016/j.jtumed.2017.06.005.

Aprile I, Stasio ED, Vincenzi MT, Arezzo MF, Santis FD, Mosca R, Padua L (2016). The relationship between back pain and schoolbag use : a cross-sectional study of 5 , 318 Italian students. The Spine J. 16(6):748-755. https://doi.org/10.1016/j.spinee.2016.01.214.

Cardon G, Bourdeaudhuij L, Clercq D (2002). Knowledge and Perceptions About Back Education Among Elementary School Students, Teachers, and Parents in Belgium. J. School Health. *72*(3):100-106.

Conner M, Norman P (2005). Predicting Health Behaviour: Research and Practice with Social Cognition Models. 2nd edition. Maidenhead: Open University Press.

Desouzart G (2017). Analysis of Postural Changes in 2nd Cycle Students of Elementary School. J. Spine. 6(1):2-7. https://doi.org/10.4172/2165-7939.1000357.

Dianat I, Alipour A, Jafarabadi MA (2018). Multigroup latent class model of musculoskeletal pain combinations in children/adolescents : identifying high-risk groups by gender and age. The J. Headache and Pain. pp. 1-8. https://doi.org/10.1186/s10194-018-0880-0.

Dianat I, Alipour A, Jafarabadi MA, Traffic R (2017). Prevalence and risk factors of low back pain among school age children in Iran. Health Promot. Perspect. *7*(4):223-229. https://doi.org/10.15171/hpp.2017.39.

Dolphens MBC, Danneels LDDC, Ilse DBGC (2011). Long-term effectiveness of a back education programme in elementary schoolchildren : an 8-year follow-up study. Eur. Spine. 20:2134-2142. https://doi.org/10.1007/s00586-011-1856-9.

Dullien S, Grifka J, Jansen P (2018). Cluster-randomized , controlled evaluation of a teacher led multi factorial school based back education program for 10 to 12-year old children. BMC Pediatrics. 18(312):1-10.

Franz C, Wedderkopp N, Jespersen E, Rexen CT, Leboeuf-yde C (2014). Back pain in children surveyed with weekly text messages - a 2.5 year prospective school cohort study. Chiropr Man Therap. 22(35):1-12.

Geldhof E, Cardon G, Bourdeaudhuij ID (2007). Back posture education in elementary schoolchildren : a 2-year follow-up study. Eur. Spine J. 16:841-50.

Glanz K, Rimer B, Viswanath K (2008). Health Behavior and Health Education: Theory Research and Practice. San Francisco. Jossey-Bass Publishers.

Janakiraman B, Ravichandran H, Demeke S, Fasika S (2017). Reported influences of backpack loads on postural deviation among school children : A systematic review. J. Educ. Health Promot. 6:1-12.

Kamper SJ, Henschke N, Hestbaek L, Dunn KM, Williams CM (2016). Musculoskeletal pain in children and adolescents. Braz. J. Phys. Ther. *20*(3):275-284.

Kamper StJ, Parma T, Williams CM (2017). The prevalence, risk factors, prognosis and treatment for back pain in children and adolescents : An overview of systematic reviews. Best Practice & Research Clinical Rheumatology. pp. 1-16. https://doi.org/10.1016/j.berh.2017.04.003.

Khanzada S, Khanzada SK, Khan MS, Shaikh S, Mirza RA, Naaz E, Khalid S (2016). Revalence of backache among school going children of hyderabad, sindh. Int. J. Physiother. 3(1):11-14.

Maher C, Underwood M, Buchbinder R (2017). Non-specifi c low back pain. Lancet. 389:736-47. https://doi.org/10.1016/S01406736(16)30970-9.

Mohammed Z (2017). Impact of Prolonged Periods Classroom Settings in Intra-abdominal fat area and its Consequence on Posture/Balance Control among Algerian Childhood College Preparatory School. Int. J. Appl. Exer. Physiol. 6(2):20-27.

Nichele B, Furlanetto TS, Noll M, Sedrez JA, Francine E, Schmit D, Candotti CT (2017). 4-year Longitudinal Study of the Assessment of Body Posture, Back Pain, Postural and Life Habits of Schoolchildren. Motricidade. 13(4):3-12.

Noll M, Candotti C Udia T, Vieira A, Fagundes J (2013). Back Pain and Body Posture Evaluation Instrument (BackPEI): development , content validation and reproducibility. Int. J. Public Health. (58):565-572. https://doi.org/10.1007/s00038-012-0434-1.

Yue P, Liu F, Li L (2012). Neck / shoulder pain and low back pain among school teachers in China , prevalence and risk factors. BMC Public Health. *12*(1):1. https://doi.org/10.1186/1471-2458-12-789.