

A Study on the Back Pain and Sitting Postures of High School Students in Gyeongnam Province

Jun-Cheol Lee*

**Department of Physical Therapy, Kyungnam College of Information & Technology, Korea*

Abstract

This study aimed to examine the postures and behaviors of high school sophomores in Gyeongnam Province in daily life and the relations between back pain and sitting postures, and to identify undesirable behaviors and postures in daily life, and the following conclusions were obtained. The relation between back pain and cupping the chin in one of the two hands in rotation or sitting with the legs crossed or sitting on a chair with the back and hip not leaning against the backrest was statistically significant ($p < 0.05$). The results above indicated that high school sophomores in South Korea spend most of the day sitting on a chair in school and that undesirable behaviors using one side of the body, such as cupping the chin in one of the two hands in rotation or sitting with the legs crossed, cause back pain. In addition, those who sit on a chair with the back and hip leaning against the backrest experienced less back pain than those who did not, and exercises after school were found to be helpful to prevent back pain.

Keywords: *Back pain, Sitting posture, Behaviors in daily life, High school students*

1. Introduction

Scientification, informatization, industrialization and urbanization in modern society result in remarkable development including improvements in the quality of life and increasing leisure hours, but automation and transportation development in daily life have decreased opportunities for physical activities [1]. Due to unique educational conditions in South Korea, high school students study too long for college entrance exams and thus hardly look after their health, which is expected to cause back pain frequently [2] [3] [4].

Back pain is a term that expresses pain around the waist and its symptoms, and does not refer to a specific disease or a syndrome [5] [6]. The general cause of back pain is habitual undesirable postures, and those who have less awareness of correct postures often experience back pain [7].

In particular, after sitting for a long time in a tense posture, the tension is gradually relieved from the body and sitting slouched over causes the hyperextension of ligaments around the waist. Sitting for a long time with the ligaments hyperextended results in pain. Those who habitually have this poor posture, sitting slouched over, or those who have to work sitting at their desk most of the day easily slouch on a chair, which can cause back pain frequently [8] [9].

Since time for sitting on a chair is longer than that for standing, it is important to have a correct position

on a chair. While standing, a person can control their posture as they want. However, postures are more likely to be controlled by artificial elements than a person's intention in a seated position, and, thus, it is necessary to choose a proper chair for a comfortable position [1]. The pressure imposed on the lumbus while working in a seated position with the back bending is 1.8 times higher than that in a standing position, which easily causes back pain [10]. In a study that performed a biomechanical test, the pressure applied to a lumbar disc in a seated position was found to be 1.4 times higher than that in a standing position [11].

Back pain that ordinary people or industrial workers often experience is mostly first observed in their 20s~40s, and thus it has been recognized as a relatively uncommon disease among children or teenagers [12]. However, the share of patients in their 10s who are hospitalized due to back pain continues to increase in Korea [13]. This is attributable to undesirable behaviors in daily life such as excessive use of computers, lack of education on health care and exercises, and poor postures while learning [4].

Undesirable behaviors in daily life affect the muscle shape and skeletal structure of the body of teenagers, which is highly likely to cause the abnormal development of the body in different forms. Therefore, maintaining proper postures in daily life is very important for adolescents who continue to grow up [12] [14]. Correct postures improve the external beauty of the body, and also have important values in terms of health as they directly and indirectly affect the growth and development of the body, ability to work, motor ability, etc. [1] [15].

It is often said that behaviors in daily life affect the formation of postures, but earlier studies on postures mostly focused only on examining the level of postural deformities by measuring postures. The effects of different behaviors in daily life on postural deformities have not been researched in detail, and thus there are only few data available for providing education on postures at school [1] [14].

In this regard, this study aimed to examine the postures and behaviors of adolescents that cause back pain in daily life, to identify the correlation between adolescents' postures and behaviors, and to suggest ways to correct and improve poor behaviors and postures in daily life. The results are expected to be useful for those who are preparing for college entrance exams.

2. Research Methods

2.1 Subjects

To select subjects, a total of 100 male and females sophomores in K high school located in Gyeongnam Province, Korea, were randomly sampled. Those who insufficiently or incompletely answered (9 respondents) were excluded, and thus a total of 91 students were selected as subjects in this study.

2.2. Data Collection Methods

Data were collected from August 5 to 10, 2017. After visiting K high school and informing homeroom teachers of the purpose of this study, the questionnaires used in this study were distributed to sampled students, and their answering sheets were collected.

2.3 Analysis Methods

This study utilized the questionnaire suggested by Lee (2004) [1], and, to do so, reliability test was carried out on the questionnaire three times using SPSS 10.0. Since its alpha value was .8240, the questionnaire were utilized to develop a questionnaire for this study. The quantitative analysis of questionnaires was analyzed using the cross-tabulation analysis of SPSS (2*5, 2*2), and their qualitative analysis was performed using independent T test in SPSS.

3. Research Results

3.1 Back Pain Group and Non-Back Pain Group

The surveyed subjects were divided into the back pain group and the non-back pain group, and the number of subjects in the two groups was 39 and 52 respectively.

3.2 Relation Between Back Pain and Cupping the Chin in One Hand

To the question “Do you cup your chin in one of the two hands in rotation?” the answers of both the back pain group and the non-back pain group were statistically significant ($p=0.049$) ($p<0.05$). To the question, 6 out of 39 subjects in the back pain group answered positively (strongly agree, agree), accounting for 15%, and 21 subjects answered negatively (disagree, strongly disagree), accounting for about 53%. In the non-back pain group, 17 out of 52 subjects answered positively (32%) and 15 subjects answered negatively (28%) (Table 1).

Table 1. Cupping the chin in one of the two hands in rotation

Back pain	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Significance probability (p value)
Yes	1(3)	5(13)	12(31)	17(44)	4(10)	39	0.049*
No	3(6)	14(27)	20(38)	10(19)	5(10)	52	
Total	4(4)	19(21)	32(35)	27(30)	9(10)	91	

Unit: person(%)

* $p<0.05$

3.3 Relation Between Back Pain and Sitting with Legs Crossed

To the question, “Do you sit with your legs crossed?” the answers of both the back pain group and the non-back pain group were statistically significant ($p=0.018$) ($p<0.05$). To the question, 11 out of 39 subjects in the back pain group answered positively (strongly agree, agree), accounting for about 38%, and 19 subjects answered negatively (disagree, strongly disagree), accounting for about 53%. In the non-back pain group, 5 out of 52 subjects answered positively (10%), and 36 subjects answered negatively (70%) (Table 2).

Table 2. Sitting with the legs crossed

Back pain	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Significance probability (p value)
Yes	3(8)	8(21)	9(23)	14(36)	5(13)	39	0.04*
No		5(10)	11(21)	27(52)	9(17)	52	
Total	3(3)	13(14)	20(22)	41(45)	14(15)	91	

Unit: person(%)

* $p<0.05$

3.4 Relation Between Back Pain and Backrest

To the question, “Do you sit on a chair with your back and hip leaning against the backrest of the chair?” the answers of both the back pain group and the non-back pain group were statistically significant ($p=0.04$)

($p < 0.05$). In the non-back pain group, the share of subjects who answered “agree” (36%) was higher than that of subjects who answered “disagree” (15%), while the share of subjects who answered “disagree” (41%) was higher than that of subjects who answered “agree” (23%) in the back pain group (Table 3).

Table 3. Sitting on a chair with the back and hip leaning against the backrest

Back pain	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Significance probability (p value)
Yes		9(23)	11(28)	16(41)	3(8)	39	0.04*
No	3(6)	19(37)	20(38)	8(15)	3(4)	52	
Total	3(3)	28(31)	31(34)	24(26)	5(5)	91	

* $P < 0.05$

3.5 Relation Between Back Pain and Bending the Waist Forward

To the question, “Do you tend to bend your waist forward while writing down?” the answers of both the back pain group and the non-back pain group were not statistically significant ($p = 0.636$) ($p < 0.05$). To the question, those who answered they leaned the waist forward by “60 degrees” from their desk accounted for 46% of the back pain group, followed by “45 degrees” (31%), “30 degrees” (18%), and “90 degrees” and “lying the face down” (3% respectively). The share of those who answered “60 degrees” in the non-back pain group was 48%, followed by “45 degrees” (37%), “30 degrees” (12%), “90 degrees” and “lying the face down” (2% respectively) (Table 4).

Table 4. Bending the waist forward in class

Back pain	90 degrees	60 degrees	45 degrees	30 degrees	Lying face down	Total	Significance probability (p value)
Yes	1(3)	18(46)	12(31)	7(18)	1(3)	39	0.636
No	1(2)	25(48)	19(37)	6(12)	1(2)	52	
Total	2(2)	43(47)	31(34)	13(14)	2(2)	91	

Unit: person(%)

* $p < 0.05$

3.6 Relation Between Back Pain and Using Sofa at Home

To the question, “Do you have a sofa at home?” the answers of both the back pain group and the non-back pain group were not statistically significant ($p = 0.920$) ($p < 0.05$). To the question, 28 subjects out of 39 subjects in the back pain group answered “using a sofa,” accounting for 72%, and 10 subjects answered “not using a sofa,” accounting for 28%. In the non-back pain group, 36 out of 52 subjects answered “using a sofa,” accounting for 62%, and 15 subjects answered “not using a sofa” (38%) (Table 5).

Table 5. Using a sofa at home Unit

Back pain	Using a sofa	Not using a sofa	Degrees of freedom	Total	Significance probability (p value)
Yes	28(72)	10(28)	1	39	0.920
No	36(62)	15(38)	1	52	

Total	64	25	2	93	
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Unit: person(%)

3.7 Relation Between Back Pain and Exercising After School

To the question, "Do you exercise after school?" the answers of both the back pain group and the non-back pain group were statistically significant ($p=0.006$) ($p<0.05$). To the question, 5 out of 39 subjects in the back pain group answered positively (strongly agree, agree), accounting for about 13%, and 27 subjects answered negatively (disagree, strongly disagree), accounting for 70%. Unlike the back pain group, 15 out of 52 subjects in the non-back pain group answered positively (about 29%), and 21 subjects answered negatively (about 41%) (Table 6),

Table 6. Exercising after school

Back pain	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Significance probability (p value)
Yes	1(3)	4(10)	7(18)	19(49)	8(21)	39	0.006'
No	5(10)	10(19)	16(31)	17(33)	4(8)	52	
Total	6(7)	14(15)	23(25)	36(40)	12(13)	91	

p<0.05

Unit: person(%)

3.8 Relation Between Back Pain and Hours of Using Computers

The average hours of using computers in the back pain group and the non-back pain group were 2.82 and 2.93 hours respectively, showing no statistically significant difference (Table 7).

Table 7. Group statistics (Hours of using computers)

Hours of using computers	Back pain	N	Average	Standard deviation	Standard error of average
	Yes	38	2.82	3.02	.49
	No	52	2.93	2.73	.38

Unit: person(%)

3.9 Relation Between Back Pain and Traumatic Experiences

To the question on traumatic experiences, the average value of the back pain group was 0.89, while that of the non-back pain group was 0.85, showing a slight difference between the two groups (Table 8).

Table 8. Group statistics (Experience of traumatic experiences)

External Injury	Back pain	N	Average	Standard deviation	Standard error of average
	Yes	38	.89	2.19	.36
	No	52	.85	1.39	.19

Unit: person(%)

4. Discussion

This study examined the relations between the back pain and different postures of high school sophomores.

Cupping the chin in one of the two hands in rotation and sitting with the legs crossed were found to be risk factors, and those who sit on a chair with the back and hip leaning against the backrest or exercise after school tend to show low back pain. However, bending the waist forward or using a sofa at home or hours of using computers were found to be irrelevant.

Makhsou (2003) [16] studied the location of the hipbone and sitting postures on a chair with a backrest and reported that subjects maintained lordosis on a chair with a backrest, which reduced back pain. Kim et al. (1996) [2] said not placing the body against the backrest is a very poor posture. In this study, sitting on a chair with the back and hip leaning against the backrest was found to cause low back pain.

Excessive exercises may damage the back of students and cause pain in the back, but lack of exercises or activities has been pointed out as a major cause of back pain [3] [17]. The results of this study also showed that many students think their back pain is caused by lack of exercises, and that the frequency of back pain was higher in students who regularly exercise than in students who exercise less. Students have little time to do leisure activities and exercises as they are too busy studying, which is recognized as another major cause of back pain [17]. Lee et al. (2014) and Lee et al. (2013) found that back pain is more frequently experienced by those who did not do William's and McKenzie's exercises or lumbar stabilizing exercises regularly than those who did them regularly [19] [20]. It was also reported that lack of exercises or leisure activities results in muscular contraction and reduced muscular strength, which cause back pain [21] [22] [23]. In this study, regular exercises were found to be very effective in preventing back pain.

A desk of which height is lower than that of a student makes him or her feel uncomfortable, is not good for his or her posture and causes more pain in the back, which was attributed to the uncomfortable posture of the student – studying at the low desk while slouching forward [2]. Those who answered that their desk in school is uncomfortable accounted for 84.5% of the surveyed students, which was attributed to their low desks that make students slouch forward and put strain on their back [24]. However, the results of this study indicated that the degree of bending the waist forward while writing down is not related to back pain.

People tend to think using sofas and beds at home increases comfortability in daily life, and to prefer excessively soft sofas and beds, which rather causes back pain [25]. Too firm or hard chairs or bedding put strain on the back, and too soft chairs or bedding also fail to support the back, and thus increase muscular tension in the back and the relaxation of the abdominal muscles [26] [27]. However, the results of this study showed that the use of sofas at home did not affect the occurrence of back pain.

Sitting on a chair for over 4 hours a day was known to cause back pain [28], and it was also reported that students frequently suffer from spinal diseases and back pain due to their shortened and hardened lumbar muscles after playing computer games, and that the frequency of the occurrence of spinal diseases has gradually increased over time [9]. However, the results of this study showed that students used computers for 2~3 hours on average, showing no relation with back pain. Earlier studies reported that using computers for long hours, that is, sitting on a chair for over 13~16 hours a day, increases the experience rate of back pain [13] [29] [30].

It was reported that over 30% of spinal disc herniation cases in adolescence are related to external injuries [31], and that 102 (24.7%) out of 413 patients had post-traumatic back pain [32]. In another study, 32 (14.5%) out of 220 patients also had post-traumatic back pain [33]. In this study, however, the average values of questions about the existence of back pain and experience of trauma did not coincide with the results of these earlier studies, showing no sign of the relation between back pain and trauma. Hahn and Manson (1982) [18] suggested that trauma, other than sports activities, is not a major cause of back pain, reporting a similar result of this study.

There are some limitations in this study. This study was conducted on some high school students in

Gyeongnam Province, and thus it will be difficult to generalize the results as a national tendency. The results of factor analysis indicated that the number of questions on some factors is too small to interpret, and thus they were excluded from this study.

5. Conclusions

We research is a carried out to examine the postures and behaviors of high school sophomores in daily life, and the relations between back pain and different postures, and to identify undesirable behaviors and postures in daily life, and the following conclusions were obtained. The significance probability of the relation between back pain and cupping the chin in one of the two hands in rotation was $P=0.049$, which was statistically significant ($p<0.05$). The significance probability of the relation between back pain and sitting with the legs crossed, was $p=0.018$ which was statistically significant ($p<0.05$). The significance probability of the relation between back pain and sitting on a chair with the back and hip leaning against the backrest was $p=0.04$, which was statistically significant ($p<0.05$). The significance probability of the relation between back pain and bending the waist forward while writing down was $p=0.636$, which was not statistically significant ($p<0.05$). The significance probability of the relation between back pain and using a sofa at home was $p=0.920$, which was not statistically significant ($p<0.05$). The significance probability of the relation between back pain and doing exercises after school was $p=0.920$, which was not statistically significant ($p<0.05$). The average hours of using computers in the back pain group and the non-back pain group were 2.82 and 2.93 respectively, showing no statistically significant difference.

To the question on traumatic experiences, the average value of the back pain group was 0.89, while that of the non-back pain group was 0.85, showing no statistically significant difference.

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