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Effect of Regular Corrective Exercises on the Spinal Column of Dyspraxic Patients

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Abstract

***Background*:** Spinal column abnormalities can highly restrict motor movement in students with dyspraxia. The present study investigated the effect of regular corrective exercises on the spinal column of students with dyspraxia.

***Materials and Methods*:** The present study is a quasi-experimental research. For the purposes of the study, spinal column abnormalities of a total of 150 girls and 220 boys were analyzed. The subjects then went through a 12-week period of corrective exercises. The students' spinal column abnormalities were re-examined to determine the effects of the exercise. The study employed SPSS-16 to analyze the data. Also, for the purposes of the study, statistical-descriptive methods, samples *t*-test and Pearson's correlation coefficient were used to further analyze the data in detail.

***Results*:** The results of the study indicated that students with dyspraxia constituted 6.16 % of the total sample. That is to say, dyspraxic girls and boys made up 5% and 7.3% of the sample, respectively. Moreover, 60% of the boys and 63.3% of the girls suffered from spinal column abnormalities. The results of the experiment indicated that corrective exercises can reduce spinal column abnormalities in school students.

***Conclusion*:** The results of the experiment indicated that corrective exercises can reduce spinal column abnormalities in school students.

Introduction

Among the most prevalent disorders in elementary school students are developmental coordination disorder and dyspraxia that affect movement ability in children. That is, the disorders largely restrict children's ability to perform bodily movements. In their study, Kuiper et al. indicated that students with dyspraxia showed less tendency to play during the break time in school than healthy children with normal bodily movements [1]. In a similar study, Seyyed Ahmadi et al. established that spinal column abnormalities is the principal cause of dyspraxia among the students [2]. The posture of the spinal column depends heavily on the performance of its muscular, osteal and articular structure. In other words, muscular weakness in the spinal column can disturb the postural balance, a condition often called postural abnormality which is also often attributed to sedentariness, environmental factors and wrong improper movement patterns [3]. Corrective exercises are considered to be of great remedial value to postural abnormalities. Coordinating agonist and antagonist muscles through strengthening and stretching activities, corrective exercises are able to treat dorsal kyphosis, scoliosis and lordosis. To be more precise, corrective exercises involve strengthening, stretching and neuromuscular facilitation exercises [4]. As corrective exercises involve physical activities and bodily movement, they are regarded, in most body of study conducted in the field, as improving body posture. The present study, however, maintains not only that taking corrective exercises over a certain period of time help tackle movement problems namely dyspraxia in school students, but also that they contribute to the students' mental health.

Materials and Methods

The present study was a quasi-experimental research conducted in 2010. The sample included the elementary school students of Torbat-e-Jam, a small town east of Iran. The subjects were chosen through a cluster random selection. Using a self-administered perceptual-motor evaluation questionnaire with an estimated credit of 0.86, the preliminary data was obtained from 6000 school students ranging from 10 to 12. The questionnaire presented 14 perceptual-motor disorder cases and asked students whether they thought they suffered from any of the cases. For the purposes of our study, we asked physical education teachers of the same schools to complete the questionnaires before they were delivered to the researchers. A total of 550 students (210 females and 340 males) with at least 5 disorder cases out of 14 were regarded as being dyspraxic by the teachers. The subjects then were asked to take the Kopart Perceptual-motor test, a 22-item test consisting of state and balance, body image and difference recognition, perceptual-motor connection, eye control and image understanding with an estimated

credit of 0.95. The final sample of the study included 370 subjects who received poor grades on the test compared to the rest of the subjects in the sample and who were diagnosed with dyspraxia. The next stage of the experiment involved investigating the prevalence of spinal column abnormalities in dyspraxic students using a flexible ruler (with a credit of 0.95 for kyphosis and 0.84 for lordosis) and a grid plane in both sagittal and frontal planes. The subjects then went through a 12-week period of corrective exercises with an accent on strengthening, stretching and flexibility activities. Spinal column abnormalities in the subjects were re-examined in order for the researchers to evaluate the effectivity of the exercises. The study employed SPSS-16 to analyze the data. Also, for the purposes of the study, statistical-descriptive methods (frequency, mean and standard deviation), paired samples *t*-test, independent samples *t* test and Pearson's correlation coefficient (at a significant level: 0.05) were used to further analyze the data in detail.

Results

Students with dyspraxia constituted 6.16 % of the total sample. That is to say, dyspraxic girls and boys made up 5% and 7.33% of the sample, respectively. Of this, a total of 2.45% suffered from severe dyspraxia. According to pre-test figures, the spinal column deviation in the subjects presented in "degree" were as follows: kyphosis (29.1±5.1 in girls vs. 31.1±4.9 in boys), lordosis (30.6±6.2 in girls vs. 28.5±5.6 in boys) and scoliosis (42.5±4.5 in girls vs. 41.2±3.4 in boys). Independent samples *t*-test, as can be seen from Table 3, indicated that there was a significant difference ($p<0.004$) between the two groups in terms of the abnormality types they suffered from. While the girls were diagnosed with severe lordosis and scoliosis abnormalities, the boys suffered predominantly from kyphosis. That is, statistically, the prevalence of lordosis, kyphosis and scoliosis in the girls were 40%, 31.57% and 28.42% respectively. The figures for the same disorders for the boys were 35.25%, 32.57% and 30.30% respectively (Table 1). After 12 weeks of corrective exercises, however, significant changes were observed. The figures for lordosis, kyphosis and scoliosis in the girls dropped from 30.6±6.2, 29.1±5.1 and 42.5±4.5 to 28.01±4.8, 26.5±3.8 and 39.8±2.9, respectively. Similarly, the figures for the same disorders in the boys decreased from 28.5±5.6, 31.1±4.9 and 41.2±3.4 to 24.9±5.2, 27.5±4.1 and 38.95±2.6, respectively. Paired samples *t* test for the two groups suggested that the changes were significant ($p=0.005$) (Table 2).

Table 1. Comparison of spinal column abnormalities between boys and girls before corrective exercises

Variable		N	Mean±SD	*p*-Value
Kyphosis	Girls	30	29.1±5.1	0.003
	Boys	43	31.1±4.9	
Lordosis	Girls	38	30.6±6.2	0.004
	Boys	49	28.5±5.6	
Scoliosis	Girls	27	42.5±4.5	0.004
	Boys	40	41.2±3.4	

Table 2. Comparison of spinal column abnormalities between boys and girls after corrective exercises

Variable		Pretest Mean±SD	Post test Mean±SD	*p*-Value
Kyphosis	Girls	29.1±5.1	26.5±3.8	0.001
	Boys	31.1±4.9	27.5±4.1	0.003
Lordosis	Girls	30.6±6.2	28.1±4.8	0.005
	Boys	28.5±5.6	24.9±5.2	0.003
Scoliosis	Girls	42.5±4.5	41.2±3.4	0.002
	Boys	41.2±3.4	38.95±2.6	0.006

Discussion

The findings of the study suggested that a total of 6.16% of the students (5% of the girls and 7.33% of the boys) suffered from dyspraxia. It was also observed that 60% of the boys and 63.33% of the girls suffered from spinal column abnormalities.

The results of the experiment indicated that corrective exercises can reduce spinal column abnormalities in school students. It has now been established that developmental coordination disorder accounts for motor disorders in children. The disorder appears in early childhood mostly in the child's endeavor to perform movements requiring coordination skills [5]. That is the reason why dyspraxic students show abnormal movements.

Elementary school curriculum includes skills development in children. This helps diagnose motor disorder during the early years and provides immediate and effective treatment for students with developmental coordination disorder and dyspraxia. The present study conforms to the study conducted by Gobay in terms of dyspraxia prevalence [6]. It also confirms Gordon and Mckinaly's study in the claim that more boys than girls suffer from dyspraxia [7]. It was also observed that 2.45% of school students were affected by severe dyspraxia, a figure fairly conforming to that (2%) in Partwood's study [8]. In addition, the findings hold that dyspraxic students show less tendency to play with their peers which is the major reason why they suffer from muscular and skeletal problems [1, 13].

A large body of study has so far been conducted on school students of the similar age group suggesting that a high percentage of school students suffer from skeletal disorders particularly spinal column abnormalities, which conform to the findings of the present study [9, 10]. It was also observed in the present study that no more than 36% to 40% of the students enjoyed good physical health which was indicative of the high percentage of spinal column abnormalities among the students (60% of the boys and 63.33% of the girls). A similar study made by Eghbali indicated that 78.85 of the students were affected by spinal deviation while only a disappointing 21.2% of them enjoyed normal health [11].

Moreover, our findings suggested that while the girls were diagnosed with severe lordosis and scoliosis abnormalities, the boys suffered predominantly from kyphosis which conforms to the study conducted by Kargarfred et al. The difference can probably be explained by their physical and behavioral differences

[12]. It has been established in various studies that corrective exercises are of great remedial value in the treatment of skeletal disorders. Hence, the present study conducted an experiment by involving school students in a 12-week course of corrective exercises to help treat the disorder.The findings revealed that by the end of the course, spinal column abnormalities among school students had significantly reduced. This conformed to the study by Burret and Meyer [4, 13]. Meyer maintains that strengthening exercises affects the tendons length, causes regular skeletal movements and strengthens the ligaments. Stretching exercises, on the other hand, help coordinate agonist and antagonist muscles [4]. In their study, Ameri et al. claimed that paraspinal muscular disorders were a major cause of scoliosis. Therefore, it seems that the strengthening of the spinal muscles can help prevent scoliosis [14].

Furthermore, it is advisable that strengthening, stretching and aerobic exercises be performed regularly to help treat weak, shortened muscles, and to facilitate movement in weak, stiff joints. Besides, participating in health education programs where participants are advised on how to walk upright, what clothes to wear and what exercises to perform can be of great use. Exercises promoting both physical and mental health are highly recommended for patients with motor disorders. Also, the findings of the study revealed that corrective exercises were effective in reducing lordosis. That is to say, strengthening and stretching exercises coordinated shortened and expanded muscles which helped reduce the anterior pelvic tilt. This largely conformed to the results of the study carried out by Farzam and Meyer. Moreover, easing part of the tension in the area, stretching and flexibility exercises helped lessen the lordosis curve [4, 15].

As a general rule, it can be argued that spinal deviations in young people are more flexible and less hard compared to those of the elderly. As spinal deviations in young people, in contrast to those in the elderly, lack such typically visible symptoms as pain and nervous strains, it is highly recommended that young people receive early treatment so as to prevent high treatment cost and the dire health consequences at an advanced age. It can, therefore, be concluded that corrective exercises are extremely useful in helping dyspraxic students cope with their problems. Con

venient, economical and producing minimal side effects, if at all, corrective exercises seem to be of great help in reducing spinal column deviation as well as motor and mental disorders in dyspraxic students. There is no disputing the fact that skeletal disorder treatment requires a relatively long period of time to take effect. Due to time limitations for the present study, however, a 12-week period of corrective exercises was implemented by the researchers. It is useful to bear in mind that to obtain favorable results entails a longer period of regular exercise.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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