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PRACTICES FOR SPINAL HEALTH IN INDIVIDUALS IN CHILDHOOD: THE CASE OF ALTINDAG MUNICIPALITY

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ABSTRACT

Purpose: It is known that spine-related pain in childhood is a significant risk factor for pain in adulthood. The aim of this project was to evaluate the effects of spine health awareness education and exercises on physical fitness, quality of life, body image, and pain.
Methods: The project included five girls and one boy. An exercise program was applied to the individuals, including stretching, strengthening, and posture exercises for 60 minutes, two days a week for six weeks. Pain intensity was evaluated using the Numeric Pain Scale, posture using the New York State Posture Scale, quality of life using the Pediatric Quality of Life Questionnaire, and body image using the Children's Body Image Scale. Balance tests on one leg, sit-up tests, handgrip muscle strength tests, and sit-to-stand flexibility tests were used to evaluate the physical fitness of the individuals. All assessments were repeated at baseline and after six weeks.
Results: After the exercise program, there was an increase in the results of the sit-to-stand test evaluating flexibility and hand grip strength performance evaluating muscle strength ($p<0.05$). The level of dissatisfaction decreased in body image results ($p<0.05$). No change was observed in the quality of life scores of the individuals after the program ($p>0.05$).
Discussion: As a result of the project, an improvement was observed in physical fitness parameters, including muscle strength, flexibility, and body image. These positive results and the content of the programs can be used in future studies to develop preventive approaches with long-term follow-up.
Key Words: spine, body image, childhood, posture, exercise

ÖZET

Amaç: Çocukluk çağındaki omurga ağrısının yetişkinlikteki ağrı için önemli bir risk faktörü olduğu bilinmektedir. Bu projenin amacı omurga sağlığı farkındalık eğitimi ve egzersizlerin fiziksel uygunluk, yaşam kalitesi, beden imajı ve ağrı üzerine etkinliğini belirlemektir.
Yöntem: Projeye 5 kız ve 1 erkek çocuk dahil edildi. Bireylere altı hafta boyunca, haftada iki gün 60 dakika germe, kuvvetlendirme ve postür egzersizlerini içeren bir egzersiz programı uygulandı. Ağrı şiddeti Sayısal Ağrı Ölçeği, postür New York State Postür Ölçeği, yaşam kalitesi Pediatrik Yaşam Kalitesi Anketi ve beden imajı Çocuk Beden İmajı Ölçeği ile değerlendirildi. Bireylerin fiziksel uygunluğunu değerlendirmek için Tek Ayak Üzerinde Denge Testi, Mekik Testi, El Kavrama Gücü Testi ve Oturma-Uzan Esneklik Testleri kullanıldı. Tüm değerlendirmeler başlangıçta ve altı hafta sonra tekrarlandı.
Bulgular: Egzersiz programı sonrasında, esnekliği değerlendiren otur-uzan testi ve kas kuvvetini değerlendiren el kavrama kuvveti sonuçlarında artış görüldü ($p<0.05$). Beden imajı sonuçlarında memnuniyetsizlik düzeyi azaldı ($p<0.05$). Program sonrasında bireylerin yaşam kalitesi puanlarında herhangi bir değişiklik gözlenmedi ($p>0.05$).
Tartışma: Proje sonucunda kas kuvveti, esneklik fiziksel uygunluk parametrelerinde iyileşme gözlenmiştir. Bu olumlu sonuçlar ve programların içeriği, uzun süreli takip ile önleyici yaklaşımlar geliştirmek için gelecekteki çalışmalarda kullanılabilir.
Anahtar Kelimeler: omurga, beden imajı, çocukluk çağı, postür, egzersiz

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INTRODUCTION

Correct posture is the optimal positioning of the spinal segments and each body part about the adjacent and whole segments. It is one of the critical indicators of a healthy musculoskeletal system. Development from childhood onwards is essential for a healthy posture. Due to the speed of growth and development, changes in posture occur mainly at school age. Therefore, spinal pain in childhood is often associated with postural problems (1,2)

Postural problems are caused by factors such as various musculoskeletal diseases, trauma histories, muscle weakness, and shortness. However, in recent years, there has been an increase in these problems due to decreased physical activity levels, intense school pace, long sitting hours, and increased screen exposure time (3,4). The presence of overweight/obesity in childhood also directly or indirectly negatively affects spinal health and causes postural problems (5). Therefore, its evaluation in children and adolescents is critical.

In childhood, increased anterior tilt of the cervical region, decreased cervical lordosis, increased thoracic kyphosis angle, and scapular protraction are commonly observed in postural problems. In addition, weakness in the middle part of the Trapezius and Rhomboid muscles, shortness in the Pectoralis Minor muscle, and tension and spasms in the upper part of the Trapezius muscle are frequently observed. In addition to all these effects, the incidence of scoliosis in childhood is relatively high (6). In addition, postural problems at this age can be transferred to adulthood when not managed with correct interventions (7,8).

It is known that spine-related pain is the most common problem in adulthood and that pain in childhood is a significant risk factor for pain in adulthood (9). Recent literature highlights a dramatic increase in the prevalence of spinal problems among children, with long-term consequences including a higher risk of developing degenerative disorders such as spinal deformities, alignment disorders, and spondylolisthesis even in early adulthood. These clinical outcomes not only affect individual quality of life but also contribute to escalating healthcare costs due to the complexity and chronicity of the conditions they entail (10, 11). In this context, considering the financial burden required to diagnose and treat pain, preventive studies' importance emerges again. For these efforts to succeed, programs should be initiated and continued from childhood onwards. In the literature, it is seen that studies have mostly focused on exercises for spinal health in adolescents and their results. Especially postural exercises have been shown to affect spinal alignment and postural control in adolescents positively (12, 13). However, it is thought that from the first semester of primary school to the third year of secondary school, more than 50% of children may have problems affecting the spine and other joints (14). Therefore, there is an ongoing need for studies examining interventions to protect spinal health in childhood. Teaching elementary school children proper movement patterns and posture habits is crucial for incorporating these behaviors into daily routines. Research on implementing back school programs in educational settings has demonstrated that enhancing children's knowledge, beliefs, habits, attitudes, and skills related to back care can have a significant positive impact on public health (15, 16). In addition, Hill et al. demonstrated that an exercise program and childhood spine health education contributed significantly to outcomes (17). It is seen that childhood exercise interventions are usually performed at school through teachers and are not individualized (15, 17, 18). The specific aspect of this study is that it examined the effects of physiotherapist-supervised and group-based education and personalized exercise training in childhood. Based on the existing literature, this project was planned in collaboration with Altındağ Municipality Youth Centers and Hacettepe University Faculty of Physical Therapy and Rehabilitation to raise awareness about spine health and exercise habits among children and adolescents who are members of the centers. Within the project scope, these individuals were evaluated regarding risk factors for developing spinal pain and participated in spinal health awareness training and exercise programs. The aim of this project was to evaluate the effects of spine health awareness education and exercises on pain, posture, quality of life, body image, and physical fitness parameters.

METHODS

Study design and Ethical Considerations

The project was carried out at Altindag Municipality Besikkaya Erdem Beyazit Youth Center between 01.11.2023 and 22.02.2024. The study was designed retrospectively using the data obtained from the spine health program between these dates. Our University Ethics Committee (GO 15/81) approved the study's protocol (FTREK24/23). All participants were fully informed about the study's aims and gave their voluntary consent before participation. Voluntary participation with written informed consent from both children and their legal guardians.

Participants

The study included volunteer children from the Altindag Municipality Besikkaya Erdem Beyazit Youth Center.

Inclusion criteria:

- Children aged between 8-12 years.
- Child and parental consent

Exclusion criteria:

- Presence of conditions affecting exercise participation (e.g., bone fractures, osteoporosis, diabetes, cardiovascular diseases)
- Presence of acute or chronic musculoskeletal or neurological conditions.

Intervention

Spinal health awareness (correct posture, carrying bags, etc.) and exercise training were applied to the individuals participating in the study. The training program was implemented for six weeks, two days a week, 60 minutes. At the beginning of the first session of the first week of this program, participants were given a 30-minute informative presentation on topics such as correct spinal posture, carrying bags and things to consider for spinal health. Then the exercise training started. Individuals participated in an exercise program that included stretching, strengthening, and posture exercises to bring shortened muscles to optimal length, strengthen weakened and elongated muscles, and increase body awareness. Stretching exercises targeted the pectoralis, hamstring, and calf muscles (gastrocnemius, soleus). Strengthening exercises focused on the back muscles (trapezius, rhomboid), abdominal muscles (plank, bridge), and gluteal muscles (bridge, squat). Posture exercises included chin tuck and shoulder alignment exercises. The group-based exercise training program was conducted under supervision. Each exercise was performed at a moderate intensity, with 10–12 repetitions per set and 3 sets for each exercise.

Outcome measures

The following assessments were made before and after the exercise program.

1. Socio-demographic information: Age, body weight, height, family history, screen exposure, and bag weight were recorded.

2. Pain assessment: Individuals were asked about the presence and localization of pain. Numeric Pain Scale was used to determine the pain intensity of the participants with pain. It was explained that “0” indicates the absence of pain, and “10” indicates the presence of unbearable pain. Individuals were asked to rate their pain intensity between 0-10, and their responses were recorded (19). Areas of pain were also marked on the body diagram.

3. Posture analysis: Observational posture analysis was performed to determine the individuals' postural problems. During the evaluation, the individuals were asked to give an equal amount of load to the feet and to stand where they are comfortable in daily life. The analysis was performed from three directions: side, front, and back. As a result of the analysis, the New York State Posture Evaluation System developed by Magee et al. was used to evaluate the posture (20). Accordingly, posture changes that may occur in 13 different body parts were monitored and scored. Five (5) points were given if the person's posture was correct, three (3) points if it was moderately impaired, and one (1) point if it was severely impaired. The total score obtained as a result of the test is a maximum of 65 and a minimum of 13. Scores between 56-65 are considered normal.

4. Quality of life assessment: The Turkish version of the Pediatric Quality of Life Questionnaire (PedsQL), developed specifically for children, was used to determine the participants' quality of life (21, 22). The PedsQL is a 23-item quality of life scale developed to measure the health-related quality of life of children and adolescents between the ages of 2 and 18. The PedsQL is suitable for use in large populations such as schools, hospitals, and healthy and diseased children and adolescents. The items are scored between 0-100. The higher the total score of the PedsQL, the better health-related quality of life is perceived.

5. Physical fitness assessment: Single leg balance test, sit-up test, handgrip muscle strength test, and sit-to-stand flexibility test were performed to determine the physical fitness levels of the children. Single leg balance test assesses a person's balance and postural control while standing on one leg. If the individual can stand without touching the ground for 30 seconds, the test is complete; less than 10 seconds indicates balance impairment, and less than 5 seconds indicates poor postural control (23). In the sit-up test, the subjects were repeatedly tested in 30 s flexion, and the number of trunk flexions completed was recorded (24). For hand grip strength assessment Jamar brand hydraulic dynamometer was used. The test was repeated three times, and the highest result as maximum grip force was recorded (25). The participant was asked to lie forward without shoes and with knees straight. The distance past the toes was measured 3 times, and the best result was recorded in cm (26).

6. Body image assessment: The Turkish version of the Child Body Image Scale (CBIS), developed specifically for children, aims to determine the reality of body size perception and body size satisfaction. (27, 28). The CBIS assesses children's perceptions of their body size and their satisfaction with it. The scale includes seven photographs of children with bodies ranging from very thin to obese. Children are asked to choose between figures they believe represent a child's body similar to their own (perceived) and that they would like to be (desired). A discrepancy between perceived and desired figures is an indicator of body dissatisfaction.

Statistical Analysis

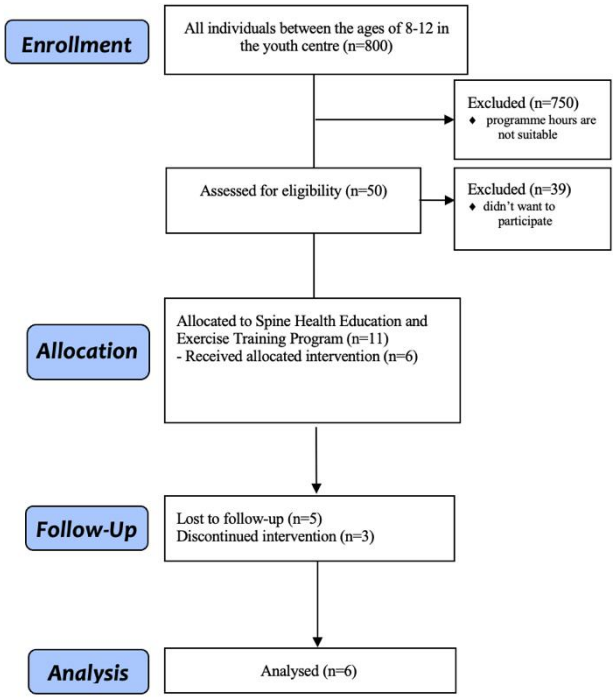
The data obtained from the project were analyzed using the statistical program SPSS (Version 20, Chicago, IL, USA). Descriptive statistics were given as mean (standard deviation) or median (first and third quartiles) and frequency (%) for continuous and categorical variables, respectively. Since parametric test conditions were not met, "Wilcoxon Signed Ranks Test" was used to compare the intra-group differences before and after treatment. The statistical significance level was accepted as $p<0.05$.

RESULTS

Characteristics of Participants

The study included 6 volunteer children from the Altindag Municipality Besikkaya Erdem Beyazit Youth Center. The study flow diagram is shown in Figure 1.

Figure 1. Flow diagram of the study



The project included five girls and one boy, 2 of whom were in 3rd grade and 4 of whom were in 4th grade. The average age of the included individuals was 8.67±0.52 years; the average height was 132.8±4.54 cm, and the average body weight was 27.68±5.5 kg. The average weight of the bag

carried by the individuals was 2.4 kg, and their average screen exposure, such as computer, phone, and tablet, was 52.5±35.18 minutes per day.

Three individuals reported pain; the pain areas were upper back, shoulder, and lower back, and the average was 1. These pains were not chronic pains but short-term musculoskeletal pains. The mean score of the New York State Posture Test (NYSPT), which evaluates the posture of the individuals, is 56.72±4.29. A score between 56-65 points for this test indicates that the posture is normal. The mean score of the individuals who participated in the study was also in the normal range. Detailed information about sociodemographic findings is given in Table 1.

Table 1. Sociodemographic Characteristics of Individuals

	Participants (n=6)
Age (year) mean±SD	8.67±0.52
Height (cm) mean±SD	132.8±4.54
Weight (kg) mean±SD	27.68±5.5
NYSPT (0-65) points	51.81±25.07
Bag weight (kg)	2.4
Screen exposure (min)	52.5±35.18
BMI (kg/m^2) mean±SD	16.48±2.27
Perceived BI-n (%)	
Weak	1 (%16.6)
Healthy	5 (%83,3)
Gender-n (%)	
Female	5 (%83,3)
Male	1 (%16.6)

BMI: Body Mass Index, NYSPT: New York State Posture Test, BI: Body Image, SD: Standart Deviation, n (%): number (percent)

Results of clinical characteristics of individuals

When the statistical analysis results of the repeated evaluations after the exercise program were examined, improvements were observed in the physical fitness measurement results of the individuals ($p<0.05$). It was found that there was an increase in the results of the sit-to-stand test ($p=0.038$), which evaluated flexibility and hand grip strength performance ($p=0.043$), evaluating muscle strength. Improvements were also observed in the results of the one-leg stand test, which evaluates balance, and the sit-up test, which evaluates muscle endurance; however, this improvement gained at the clinical level was not reflected at the statistical level ($p>0.05$). CBIS scores of the individuals improved after the exercise program ($p<0.05$). The difference between perceived and desired body image, in other words, dissatisfaction with body measurements decreased. No change was observed in the PedsQL scores of the individuals after the program ($p>0.05$) (Table 2).

Table 2. Changes in clinical characteristics of individuals after exercise program

Paramaters	**BT Median (IQR) (n=6)**	**AT Median (IQR) (n=6)**	**Z**	**p**
PedsQL	12 (7-15)	10 (7.5-15)	-0.365	0.715
Physical fitness				
Hand grip strength (kg-f)	7 (5-7)	6 (5-10)	-2.07	**0.038***
Sit-to-stand flexibility test (cm)	4 (0-8)	8 (5-12.5)	-2.023	**0.043***
Sit-up test (Repetation)	14 (12-17)	17 (12-20)	-1.841	0.066
Balance test on one leg (sn)	33 (23-54)	128 (28.7-218)	-1.753	0.08
CBIS dissatisfaction	1 (1-2)	0 (-0.5-1)	-2	**0.046***
Pain intensity (NPS) (0-10)	0 (0-2)	0 (0-0)	-1.604	0.109

IQR: Interquartile Range, B.T: Before Training, A.T: After Training, PedsQL: The Pediatric Quality of Life Questionnaire, CBIS: The Children's Body Image Scale, NPS: Numeric Pain Scale, *p<0.05

Results of the person reporting on the exercise program

Apart from the evaluation parameters mentioned in the project, self-reported opinions of the individuals participating in the project about the exercise program were also taken. Individuals responded to the questions "What did you benefit from the exercises?" as "I gained flexibility," "my muscles improved," "I relaxed," and "I lost weight." The word cloud related to these opinions is presented in Figure 2. Individuals were also asked, "What did the exercise program mean to you in one word?". Individuals responded to this question as "very

good," "good," "happiness," and "beautiful." The word cloud related to these opinions is shown in Figure 3.

Figure 2. Individuals' views on their gains from the exercise program

DISCUSSION

Our aim in the current study was to determine the effect of spine health education and exercise programs on pain severity, posture, quality of life, body image, and physical fitness. As a result of our study, the spine health education and exercise program we implemented had beneficial effects on physical fitness and body image dissatisfaction in individuals aged 8-12 years. No effect on quality of life scores was found.

The prevalence of spinal pain is known to be high in children and adolescents and increases with age. For these reasons, many are supporting the development of spine health and intervention programs in schools (13). Although strategies for spinal health have been less thoroughly studied in children and adolescents than in adult populations, different approaches from physiotherapy can be found in the literatüre (29, 30). In studies, physical exercise, postural hygiene and physical activity have been reported to be the most effective physiotherapy approaches. These approaches have demonstrated positive effects on spine care knowledge, spine care behavior, posture, trunk extension endurance and hamstring flexibility (30-32). In exercise training, it is reported that exercises for proper posture, muscle flexibility, and strengthening are beneficial, and it is emphasized that the most effective results are achieved when posture training is combined with physiotherapy exercises (33, 34). In our study, we applied a combined spine health education and exercise program in line with the approach described in the literature. As a result of our study, improvement was observed in the

Figure 3. Individuals' opinions on how they found the exercise program

results of hand grip strength and sit-lie flexibility. This result can be expected since our exercise program included flexibility, strengthening, and posture exercises. In addition, improvement was also observed in the results of sit-up and single leg balance tests clinically, but it did not reach statistical significance. We think that this may be related to the small sample size. In this context, it may be useful to examine the program's effectiveness in a larger number of samples in future studies.

A different aspect of the study is that it evaluated the effect of spinal health education and exercise program on body image perception and dissatisfaction. Slade (35) defined body image as “the picture we have in our minds of the size, shape, and form of our bodies; and our feelings concerning these characteristics and our constituent body parts.” Body shape is increasingly taken into account from the age of 6 and it is reported that 40%-50% of children aged 6-12 years show dissatisfaction with body shape and size (36). Body image satisfaction was one of the most important determinants of self-esteem for adolescents in different cultures (37, 38). In the literature, it is reported that physical activity has positive effects on body perception and general self-worth (39). In our study, spinal health education and exercise programs decreased body image dissatisfaction. The stretching, strengthening, and posture exercises we applied in our study may have improved physical fitness parameters such as muscle strength and flexibility, which may have positively affected the perception of body shape. Another different aspect of the study is that the individuals' perceptions regarding the interventions were also evaluated in addition to objective measurements and self-report scales. In this context, when asked what benefits the exercise

program had for you, individuals responded as I gained flexibility, my muscles improved, and I lost weight. The perceptions of this intervention overlap with and support the results of physical fitness tests and body image perception.

Among children and adolescents, higher levels of physical activity were associated with better health-related quality of life, and increased sedentary behavior was linked to lower health-related quality of life (40). In the study, no effect of spinal health education and exercise program on quality of life was found. Quality of life is a broad subject with different sub-fields (physical functioning, emotional functioning, psychosocial functioning, social functioning, and school functioning). The individuals in the study were at a good level in these aspects. In addition, they did not have pain problems that could affect their quality of life. This may be why there was no change in quality of life. We also did not evaluate the physical activity levels of the individuals in the study, which may have an effect on quality of life, making it difficult to make an inference. It may be useful to include more comprehensive evaluations that may affect quality of life in future studies.

Limitations and Future Perspectives

The study has some limitations that should be taken into account. The first limitation is the small sample size of our study. The second limitation is the gender inequality of the participants. These limitations affected the generalizability of the study. Furthermore, we assessed outcomes only over a short term (6 weeks). Future investigators should evaluate the efficacy of longer-term treatment protocols (12 weeks and above) in larger samples. Additionally, we did not assess the long-term follow-up results of these programs. Therefore, we cannot make inferences about the protective/preventive features of these programs. In future studies, it may be useful for researchers to determine preventive profiles with long-term follow-up studies.

CONCLUSION

Awareness of individuals starting from childhood, information about spine health, and exercise practices are essential in preventing spinal pain. In our study, a 6-week spine health education and exercise program positively affected hand grip strength, sit-stand tests, and body image perception. These positive results and the content of the group-based programs can be used in future studies to develop preventive approaches with long-term follow-up.

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