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Implementation of School Exercise Program as Prevention of Musculoskeletal Disorders in Students

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ABSTRACT

Background: Musculoskeletal Disorders (MSDs) are a form of disorders that occurs in muscles, bones, joints, ligaments and tendons. Globally, Musculoskeletal Disorders are one of the most common health problems that occur in all ages and genders. Musculoskeletal pain is one of the most common problems in Musculoskeletal Disorders, which can cause various limitations in activity and participation. Musculoskeletal pain can occur in all ages and genders, including children and adolescents. Several studies show that musculoskeletal pain most commonly occurs in the vertebrae, trunk, neck, upper extremities and lower extremities. Musculoskeletal pain in MSDs can cause various negative impacts such as reduced learning motivation, academic failure and learning problems in student. The purpose of this study is to determine the effect of implementing a school exercise training program as a prevention of Musculoskeletal Disorders.
Subjects and Method: This was a quasi experiment with no control group. Total sample of 60 children was selected for this study. The dependent variables were spinal curve deformity, degree of forward head posture, and MSDs pain. The independent variable was school exercise program. Mean score before and after intervention were tested using Wilcoxon t test.
Results: After implementing the school exercise program, spinal curve deformity (p=0.025), the degree of forward head posture (p=0.046), and MSDs pain (p=0.001) were all observed to decrease.
Conclusion: Implementing exercise programs in schools can help prevent musculoskeletal disorders among school children.

Keywords: school exercise training, musculosceletal disorders, scoliosis, forward head posture

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BACKGROUND

Musculoskeletal Disorders (MSDs) are a form of disorders that occurs in muscles, bones, joints, ligaments and tendons. Globally, Musculoskeletal Disorders are one of the most common health problems that occur in all ages and genders (Atun, 2015). New research reveals that Musculoskeletal Disorders are very common in school children and teenagers (Dianat et al., 2018). Musculoskeletal pain is one of the most common problems in Musculoskeletal Disorders, which can cause various limitations in activity and participation. Musculoskeletal pain can occur in all ages and genders, including children and adolescents

(Kamper et al., 2016). Several studies show that musculoskeletal pain most commonly occurs in the vertebrae, trunk, neck, upper extremities and lower extremities (Mwaka et al., 2014). Musculoskeletal pain in MSDs can cause various negative impacts such as reduced learning motivation, academic failure and learning problems in students (Arghavani et al., 2016).

Atia et al. (2023) found that 69.7% of general school students and 83.8% of vocational school students suffered from MSDs. In previous studies, it was found that the prevalence of MSDs varied between 10%-67% of students, this was because students spent more than 5 hours at school a day so this had a bad impact on daily activities and could increase the number of absences from school (Soares et al., 2019).

Musculoskeletal pain in children and adolescents is influenced by several factors such as mechanical load factors (type of school bag, weight of school bag), excessive body mass index, smartphone use, psychosocial stress and long sitting duration in class (Yang et al., 2017). Lack of information regarding the risk of musculoskeletal disorders in students causes increase the risk of developing symptoms of Musculoskeletal disorders. Based on the background, the purpose of this study is to determine the effect of implementing a school exercise training program as a prevention of Musculoskeletal Disorders.

SUBJECTS AND METHOD

1. Study Design

This was a quasi experiment study with no control group conducted in at Junior High Schools in Surakarta, from July to October 2023.

2. Population and Sample

Total sample of 60 students aged 14-20 years old were selected for this study. Students who have a history of musculoskeletal injury/ trauma such as fracture, muscle or ligament injuries due to sports and students with a history of congenital musculoskeletal disorders were excluded.

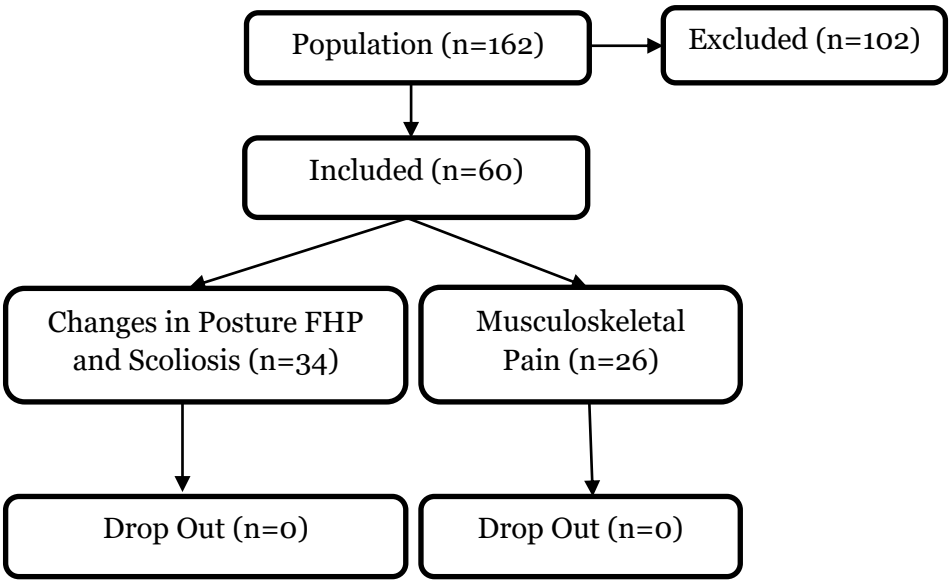

Figure 1. Flowchart of the participants

3. Study Variables

The dependent variables were forward head posture, scoliosis, and muskulosceletal pain. The independent variable was school exercise training.

4. Operational Definition of Variables

Forward head posture (FHP) is a posture disorder where the head is directed forward in the sagittal plane away from the vertical line of the shoulder. This can be characterized by the head not being in line with the shoulders. Scoliosis is defined as a vertebral deformity condition characterized by a lateral deviation of at least 10^{o} with vertebral rotation. Musculoskeletal pain is defined as acute or chronic pain that affects bones, muscles, ligaments, tendons, and even nerves, and the pain associated with musculoskeletal (MSDS) disorders.

5. Study Instruments

Scoliosis was assessed through a physical examination, employing the Adam's forward bending test and scoliometer. Measurement of musculoskeletal disorders (MSDs) utilized the Nordic Body Map, while pain levels were gauged using the Numeric Rating Scale. Additional information was gathered through a questionnaire.

6. Data analysis

Mean differences before and after the intervention in the treatment group were examined using Wilcoxon. The test is said to be significant if the p value is <0.05.

7. Research Ethics

Research ethical issues including informed consent, anonymity and confidentiality were addressed carefully during the study process. Informed consent for each subject was obtained by teachear approval. The research ethical clearance approval letter was obtained from Research Ethics Committee at Universitas 'Aisyiyah Surakarta, Indonesia No 110/VIII/AUEC/2023 on August 2023.

RESULTS

1. Sample Characteristics

The research subjects were 60 people aged 13-14 years who had scoliosis based on the results of the Adam test and scoliometer, *forward head posture* and student with musculoskeletal pain. The research results describe the characteristics of the research subjects including gender, age and degree of scoliosis. The characteristics of the research subjects can be seen in the Table 1.

Table 1. Sample characteristics of continous data

Variable	n	Mean	SD	Minimum	Maximum
Age (years)	60	14.88	0.32	14	15
Score of scoliosis (^{o}) (pre)	60	2.52	3.07	0	4
Score of scoliosis (^{o}) (post)	60	2.32	2.74	0	8
Score of forward head posture (^{o}) (pre)	60	0.23	0.42	0	1
Score of forward head posture (^{o}) (post)	60	0.17	0.37	0	1
Pain (score) pre	60	1.50	1.48	0	4
Pain (score) pre	60	1.03	1.40	0	4

Table 2. Sample characteristics of categorical data

Variable	n	%
Gender		
Female	22	37
Male	38	63

Table 3. Wilcoxon Test of school exercise program on forward head posture, scoliosis, and pain

Variable	n	Mean	SD	p
Degree of scoliosis (°)				
Pre treatment	60	2.52	3.07	0.024
Post treatment	60	2.32	2.74	
Degree of forward head posture (°)				
Pre treatment	60	0.23	0.42	0.046
Post treatment	60	0.17	0.37	
Pain (score)				
Pre treatment	60	1.50	1.48	0.001
Post treatment	60	1.03	1.40	

DISCUSSION

School age is an age that is vulnerable to an increase in the prevalence of MSDs or simply experiencing musculoskeletal pain. This can occur due to increased activity and stress as age increases (Kumar et al., 2017). Apart from being determined by this, the risk of MSDs in school students can also be caused by factors such as the weight of the school bag used, height and weight, and other causes related to the inappropriateness of the tables and chairs used at school (Mohamed, 2021; Schmidt et al., 2020).

Based on the results of our research, the condition of MSDs that occurs in students has an impact on changes in posture, namely forward head posture (FHP) and scoliosis. FHP occurs due to a change in head position which increases the load on the musculoskeletal system so that the head position leans forward and changes the craniovestibular position towards cervical flexion (Mahmoud et al., 2019). Clinically, the superficial muscles in the posterior become too tense and tighten, while the deep muscles in the front weaken, this causes the cervical posture to lean towards flexion (Romadhoni et al., 2021).

Based on table 4 of the results of the Wilcoxon Test effect test, the results show that there is an effect of giving School Exercise Training, there is a decrease in vertebral curve deformity in scoliosis conditions with a significance value of 0.024 ($p<0.05$), a decrease in forward head posture deformity with a significance value of 0.046 ($p<0.05$) and reduction in MSDS pain with a significance value of 0.001 ($p<0.05$), this states that the provision of the school exercises program is significant in reducing the number of changes in posture and the number of musculoskeletal pain in students, this is related to the implementation of the school exercises program in the form of stretching exercises.

This approach is based on exercises to strengthen and stretch problematic muscles so that muscle flexibility can be increased. Apart from increasing flexibility, this exercise can also increase range of motion, increase blood circulation, improve changes in posture and reduce stress (Gasibat et al., 2017; Schmidt et al., n.d.).

The school exercises program is easy to do and without the use of tools so that students can easily apply and do it. With this program, students are used to stretching so that they can reduce or prevent the occurrence of MSDs in students (Homeyer et al., 2023). The program, which is carried out for 4 weeks with five days in 1 week with a minimum time of 15-30 minutes, can increase the effectiveness of fitness so that there is a reduction in MSDs and Musculoskeletal pain. With school exercises, students will be diligent in doing physical activity

with the aim of improving the health of school-aged children (Song et al., 2021). Physical exercise, one of which is stretching exercise, has a significant effect in reducing the degree of scoliosis. This affects the angle of scoliosis, improving breathing and improving health rates in students with adolescent idiopathic scoliosis (Ramadhani et al., 2023).

AUTHOR CONTRIBUTIONS

Dea Linia Romadhoni contributed to the preparation of the manuscript (background, methods, results and discussion). Alinda Nur Ramadhani contributed to analysis and data processing and translated the manuscript into English.

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CONFLICT OF INTEREST

The authors declare there is no conflict of interest.

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