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THE EFFECT OF MAT PILATES IN LUMBAR FLEXIBILITY OF OVERWEIGHT AND OBESE CHILDREN

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ABSTRACT

Background : Overweight and obesity are the conditions where lumbar have to bear more load, and it will decrease its flexibility. Decrease of lumbar flexibility will affect the range of motion. Based on some literatures, mat pilates will increase the ability on lumbar flexibility, however there is no evidence effect of mat pilates in children, especially overweight and obese children. **Aim :** To know the effect of mat pilates on lumbar flexibility of overweight and obese children. **Method :** This study was pre experimental one group pre and post test design with 20 subjects based on inclusion dan exclusion criteria. Subjects did mat Pilates exercise for 12 times. Lumbar flexibility was measured by Modified Modified Schober Test for lumbal flexion and extension before intervention and after 4 weeks mat pilates exercise. Data analyzed by SPSS using Saphiro Wilk test as data's nomalities test and Paired T test as hypothesis test. **Result :** The mean of MMST Flexion pre and post test after Mat Pilates have increased from $3,15 \pm 0,3118$ cm to $7,63 \pm 0,4$ cm. The mean of MMST extension pre and post test after Mat Pilates hav e increased from $1,415 \pm 0,21$ cm to $3 \pm 0,236$ cm. The means of a BMI Post test ($24,89 \pm 0,9$ kg/m²) is higher than the mean of a BMI Pre test ($24,86 \pm 0,8$ kg/m²). The significant result proves the effect of mat pilates in lumbar flexibility of overweight and obese children which measured by MMST Flexion and MMST Extension. The result of p value for MMST Flexion is $p=0,00$ and the result of p value for MMST Extension is $p=0,00$ which both of MMST flexion and Extension are significant or different. **Conclusion :** Mat pilates can increase the lumbar flexibility of overweight and obese children. **Keyword:** Mat Pilates, Lumbar Flexibility, overweight and obese children.

INTRODUCTION

The rate of overweight and obesity in children are increased. Based on Riskesdas 2013, the prevalence of children aged 5-12 years old that experienced overweight as much as 10,8 % and 8 % classified as obesity. Overweight and obese states can impact on the limited mobility joints (range of motion). One contributing factor that impair lumbar flexibility is excessive weight pressure from excess weight.^{1,2}

Lumbar flexibility especially in children can be improved by various way of physical activity, one of them is mat pilates. Mat pilates is a part of sports, introduced by Joseph Hubertus Pilates.³ Mat pilates exercise will improve joint lubrication,

increase the distance between filaments, and decrease fibrous tissue, therefore muscles will be stretched. Static and dynamic movement in pilates will stretch sarkormer, activates golgi tendons organs, and stimulates secretions of hialuronidase enzyme. This mechanism would improve flexibility including lumbar.^{4,5}

Lumbar flexibility can be measured whether by electrogoniometer, inclinometer, MST, and Modified Modified Schober Test. MMST can be conducted by positioning the trunk flexion and extension movement, then measuring the difference measurement (shortest and longest) which representing lumbar flexibility.⁶



METHOD

This study was conducted at the Jomblang 01 Primary School, Semarang City during August 2019. This study used one group pre and post test design. The subjects was recruited by purposive sampling. There are 24 students in 4th grade who met the inclusion criteria and exclusion criteria. The inclusion criteria are ages 8-12 years old, student in Jomblang 01 Primary School, Body mass index with percentile \geq 85, didn't have any kind of other stretching exercises (Tai chi, Yoga, etc) besides intervention. While the exclusion criteria were having history of cardiovascular disease, history of spine problem or surgical (Fracture, dislocation, spondylosis, scoliosis), history of neuromusculoskeletal abnormalities, deformities on superior or inferior extremities. The subjects would be drops out from the study if the attendancy less than 10 times or absent twice in a row.

The independent variable of this study was mat pilates exercise. While the

dependent variable of this study was lumbar flexibility which was measured by MMST Flexion and Extension. The confounding variable in this study is gender.

The analytic data which include in nominal data in this study using frequency and percentage. Analytical data for numeric data using Saphiro Wilk as normality test and Paired T test as hypothesis test.

Ethics Approval

This study has obtained an ethical clearance from KEPK (Health Research Ethics Commission) with No. 136/EC/KEPK/FK-UNDIP/V/2019.

RESULTS

Subject Characteristics

This study was held on August 2019 with total 24 subjects, consist of 41,6% girls and 58,3% boys. During the study there were 4 drop out subjects. Final subjects which are used in this consist of eight (40%) girls and 12 (60%) boys. The mean for age was 9 years old.

Table 1. Subject Charateristics

Characteristics	N (%)	Mean \pm SB	Median (Min-max)
Gender			
-Girls	8 (40%)		
-Boys	12 (60%)		
Age		9,25 \pm 0,123	9,00 (9-11)
BMI Pretest (kg/m ²)		24,86 \pm 0,8	25,12 (19,66-33)
BMI Post test (kg/m ²)		24,89 \pm 0,9	24,6 (18,7-33,1)

Body Mass Index

The mean of BMI Pretest is 24,86 \pm 0,8 kg/m² with minimum 19,66 kg/m² and

maximum 33 kg/m². The mean of BMI Post test is 24,89 \pm 0,9 kg/m² with minimum BMI is 18,7 kg/m² and maximum BMI Post Test is 33,1 kg/m².



Table 2. Normality Test (Saphiro Wilk)

	Shapiro-Wilk Sig.
MMST Flexion Pre Test	,907
MMST Extension Pre Test	,017
MMST Flexion Post Test	,779
MMST Extension Post Test	,182
Delta MMST Flexion	,641
Delta MMST Extension	,431

Modified Modified Schober Test

After a test of normality data using Saphiro-Wilk, the result show MMST Flexion Pretest and Post test variables have normal distribution because $p > 0,05$. Normality results for MMST Extension Pre test don't have normal distribution because $p = 0,008$ ($p < 0,05$), in other hand MMST Extension Post test has normal distribution.

Delta MMST Extension has $p = 0,431$ ($p > 0,05$), so it is normal.

Hypothesis test

Delta MMST Flexion and Delta MMST Extension have normal distribution after getting tested by Saphiro Wilk, so both of them use Paired T test for hypothesis test.

The table shows the result of MMST Flexion and MMST Extension. Both of them have significant p value, because $p < 0,005$ ($p = 0,00$).

Table 3. Paired T test

	Paired T-Test
MMST Flexion Pre Test & MMST Flexion Post Test	0,00
MMST Extension Pre Test & MMST Extension Post Test	0,00

DISCUSSIONS

In this study there are four drops out subjects because the attendancy less than 10 times or didn't come twice in a row. Their reasons of being absence are no correlation with the study itself, such as have another lessons for competition and have tutoring lessons.

The mean of Delta MMST Flexion is higher than Delta MMST Extension. These happen because in total 16 movements, most of the movements in mat pilates trained

flexion ability more than extension ability. Moreover, other daily activities which consist of more flexion movements and it will affect the results of MMST.

The significant results of MMST Flexion and MMST Extension suggest that hypothesis approved. It means, mat pilates help increasing lumbar flexibility. It can be done because mat pilates consists of static and dynamic movement and develop vertebrae flexibility.^{5,7} Actin and myosin on sarcomere will be stretched. Golgi Tendon



organs will also be activated thus decrease the muscle tension. Cartilage on the joints will produce hyaluronidase enzyme and help to stretch muscles more.⁵ This mechanism explain how mat pilates improves flexibility of overweight and obese children.

Mat Pilates exercises can improve lumbar flexibility, this is supported by a experimental study conduted by *Dos Santos, N T, et al* (2016) which stated that there is significant increase of lumbar flexibility of 24 women after done Pilates exercises 3 times per week for 12 weeks.⁸ This study also supported by experimental study from *De Oliveira, L.C, et al* (2016) which stated that Pilates will improve trunk flexibility more than other stretching exercises on 32 old women in Brazil.⁹

There is increasing mean of body mass index post test. The results of the study are consistent with *Viera ND, et al*, which stated that flexibility on overweight and obesity people declined because of a lack of activity.¹⁰ Eventhough mat pilates improved physical activities and improved lumbar flexibility, but it didn't affect Body Mass Index.^{5, 10}

There are limitations in this study such as, didn't measure the waist circumference, and didn't control subject's daily activity which can affect the result of MMST.

CONCLUSION AND SUGGESTION

Conclusion

There were increasing flexibilities of a lumbar region before and after exercise mat pilates to the overweight and obese children.

Suggestion

1. For next experiment, need to assess the activity performed daily and intake daily which consumed by subjects during the exercise because it might influence lumbar flexibility.

2. For next experiment, need to research on the influence of mat pilates exercise to body mass index, blood pressure, respiratory ability and other aspects to know the other benefits of mat pilates.

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