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RELATIONSHIP BETWEEN BACKPACK USE AND POSITIVE EARLY SIGN OF SCOLIOSIS IN ELEMENTARY SCHOOL STUDENT

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Abstract

Background. The use of backpacks that are not suitable both in terms of design, weight of the load, and how to use it can have a negative impact on students due to increased pressure on the spinal structure of adolescents during their growth period. Early detection (scoliosis screening) must be carried out to determine the long-term effects of using the wrong backpack so that treatment can be carried out as soon as possible to avoid the occurrence of more severe musculoskeletal disorders. **Aim.** Analyzing the relationship between the use of non-ergonomic backpacks on spinal abnormalities (scoliosis) in students Cilandak Barat 08 Elementary School South Jakarta. **Method.** Analytical quantitative research, by conducting a cross-sectional study simultaneously on individuals of a population at a time. **Result.** This research found there was no significant relationship between backpack characteristics and the incidence of scoliosis (p-value 1.000) and OR 1.261. It was found that on average the respondents experienced musculoskeletal complaints due to the use of backpacks with non-ergonomic characteristics about 64.8% and scoliosis prevalence about 20.5%. **Conclusion.** There is no relationship between the characteristics of the backpack with the incidence of scoliosis. The use of a non-ergonomic backpack can still be used by considering the recommended aspects while using it.

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Introduction

Abnormalities of body posture do not only occur in someone who has entered old age but also at the age of children. This change is not only related to sitting habits, but also to the use of inappropriate bags that can interfere with the growth of the child's spine. School bags are an inseparable part of school students in general. One of the health issues concerning school-age children is musculoskeletal complaints which are thought to occur due to the use of backpacks. Meanwhile, of the various types of bags available, backpacks are the ones that are widely used (Bauer & Freivalds, 2009).

The habit of carrying a backpack has been in great demand for a long time. It is alleged that the use of a backpack is more comfortable and easy to carry. Most students use backpacks or backpacks to carry stationery, books, and school supplies due to their efficient use (Sya'bani, 2012). The use of backpacks that are not appropriate both in terms of design, weight, and method of use can have a negative impact on students due to increased pressure on the spinal structure of adolescents during their growth period (Moore, 2007 in Hendri, 2014). According to the American Occupational Therapy Association (AOTA) and the American Academy of Pediatrics, to prevent the occurrence of complaints caused by the use of a backpack, it can be done with a heavy load of no more than 15% or 10-20% of the individual's total body weight. The American Chiropractic Association (ACA) recommends that the weight of the backpack does not exceed 5–10% of a child's body weight because of the danger of overloading the spine. The weight of a school backpack should not exceed 10% of a child's body weight as it can affect their spine posture, foot shape, and gait.

Scoliosis comes from the Greek word meaning arch, meaning a pathological condition. Common signs of scoliosis include discrete shoulder blades, prominent shoulder blades, marked curvature of the spine, tilted pelvis, discrepancy between arm and body space. The curvature of idiopathic scoliosis will likely develop as it grows. As with the use of a bag for a certain duration, it is suspected that it can have an effect on spinal abnormalities. According to Haselgrove et al. (2008) almost 50% of adolescents carry a school bag more than 30 minutes a day. The results of research by Valerie, Carita, & ConneMara (2011) based on 105 respondents have asymmetrical shoulder posture which is influenced by how to use the wrong backpack. Some respondents said that they have a habit of using a backpack only on one side, while others use a sling bag. In fact, in the technique of lifting weights by being carried, you must use both shoulders so that the weight being carried can be balanced by both shoulders, so that the use of a bag with one strap has a double risk of experiencing postural abnormalities compared to using a bag with two straps.

Based on the description of the background above, the researchers wanted to analyze the relationship between the use of the backpacks with scoliosis (early sign) in order to minimize spinal deformities in elementary school students in grades IV and V.

Methods

This study uses a cross-sectional analytic observational method (cross sectional). Where this study tries to find a relationship between the variables of the use of backpacks (weight of the bag, how to use the bag, and also the duration used a bag) and the body posture abnormality, namely scoliosis to determine whether there is a relationship between those variables.

The subjects in this study were students of SDN Cilandak Barat 08 South Jakarta in grades 4 (Four) and 5 (Five). Based on the data in the field, the number of respondents was 88. Data analysis was carried out using a bivariate statistic test using the chi-square test and Fisher's Test.

The inclusion of the participants in this study were: active students in grades V and IV at SDN Cilandak Barat 08, South Jakarta

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and students who used backpacks to go to school. Then if it is in accordance with the inclusion, a physical examination of body posture and early screening for scoliosis using the Adam Forward Bending Test is carried out. Then, if it is indicated that it leads to scoliosis, the spine inclination will be measured using a scoliometer application to see the degree fall into the scoliosis category.

Results

1. Respondent Characteristic

Tabel 1. Frequency Distribution Students Based on Individual Characteristic

Variable	Category	Freauency(n)	Percentages(%)
Age	9-10 Years Old	14	15.9%
	11-12 Years Old	74	84.1%
Gender	Famale	43	48.9%
	Male	45	51.1%
Backpack Characteristic	• Cushioning Shoulder Straps	86	97.7 %
	• Uncushion Shoulder Strasps	2	2.3%
	• Chest Straps	1	1.1%
	• No Chest Straps	87	98.9%
	• Waist Straps	1	1.1%
	• No Waist Straps	87	98.9%
	• Cushioning Back's	42	47.7%
	• Uncushioning Back's	46	52.3%
Backpack Load	Lightweight	56	63.6%
	Heavy	32	36.4%
How to use the Backpack	Two Straps	86	97.7%
	One Straps	2	2.3%
Duration using Backpack	<15 minutes	71	80.7%
	>15 minutes	17	19.3%
Musculoskeletal Complaints	Painful	57	64.8%
	Not Painful	31	35.2%
Location of Musculoskeletal Complaints	Neck	11	12.5%
	Shoulder	19	21.6%
	Back's	23	26.1%
	Waist	4	4.5%
Screening Scoliosis	Scoliosis	18	20.5%
	Not Scoliosis	70	79.5%

		S	TS	S	TS
Body Posture	Head and Neck	79	1	98.8%	1.1%
	Shoulder	57	31	64.8%	35.2%
	Spine	69	19	78.3%	21.6%
	Waist	68	20	77.3%	22.7%

Based on table 1, it was found that most of the students aged 11-12 years (84.1%), male (51.1%), had normal backpack weight (63.6%), use the backpack <15 minutes (80.7 %), and how to carry a backpack with two shoulders (97.7%). Meanwhile, musculoskeletal complaints often occur with pain (64.8%), which occurs in the back (26.1%). A total of (79.5%) do not have scoliosis, however (35.2%) had an asymmetrical shoulder.

					1.265	
					1.134 – 1.410	
Without Chest Straps	69	79.3%	18	20.7%		1.000
Has Chest Straps	1	100%	0	0.0%	1.261 1.133 - 1.404	
Without Waist Straps	69	79.5%	18	20.7%		1.000
Has Waist Straps	1	100%	0	0.0%	1.261 1.133-1.404	
Uncushioning Back's	38	82.6%	8	17.4%		
Cushioning Back's	32	76.2%	10	23.8%	0.674 0.238 – 1.910	0.598

2. Relationship Backpack Characteristic and Scoliosis

Tabel 2. Relationship Backpack Characteristic and Scoliosis

Backpack Characteristic	Not Scoliosis		Scoliosis		OR	
	n	%	n	%		*P*
Uncushioning Shoulder Straps	2	100%	0	0.0%		1.000
Cushioning Shoulder Straps	68	79.1%	18	20.9%		

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Table 2 below shows the results of the Fisher test analysis, the p-value at a significance level of 5% (<0.05) indicates that there is no significant relationship between inappropriate bag characteristics and the incidence of scoliosis in grade 4 and 5 elementary school students at SD Negeri Cilandak Barat 08 South Jakarta.

3. Relationship Between Backpack Load and Scoliosis

Tabel 3. Relationship Between Backpack Load and Scoliosis

Backpack Load	Not Scoliosis		Scoliosis		OR	P
	n	%	n	%		
Lightweight	45	80.4%	11	19.6%	1.145	
Heavy	25	78.1%	7	21.9%	0.395-3.327	0.803

Table 3 shows the results of the Chi-Square test analysis, which obtained a p-value of 0.803 at a significance level of 5% (<0.05) with an odds ratio of 1.145 indicating that there is no significant relationship between backpack weight and the incidence of scoliosis in grade 4 elementary and 5 Cilandak Barat 08 Elementary School

4. Relationship How to Carry The Backpack and Scoliosis

Tabel 4. Relationship How to Carry The Backpack and Scoliosis

How to Carry Backpack	Not Scoliosis		Scoliosis		OR	P
	n	%	n	%		
One Straps	1	50%	1	50%	4.059	
Two Straps	69	80.2%	17	19.8%	0.241 - 68.241	0.369

Table 4 shows the results of the Fisher test analysis, which obtained a p-value of 0.369 at a significance level of 5% (<0.05) with an odds ratio of 4,059 indicating that there is no significant relationship between how to carry a backpack on the incidence of scoliosis in grade 4 and 5 Cilandak Barat 08 Elementary School.

5. Relationship Duration Using The Backpack and Scoliosis

Tabel. Relationship Duration Using The Backpack and Scoliosis

Duration Using The Backpack	Not Scoliosis		Scoliosis		OR	P
	n	%	n	%		
>15 Minutes	13	76.5%	4	23.5%	1.253	
<15 Minutes	57	80.3%	14	19.7%	0.354 - 4.374	0.743

Table 5 shows the results of the Fisher test analysis, which obtained a p-value of 0.743 at a significance level of 5% (<0.05) with an odds ratio of 1.253 indicating that there is no significant relationship between the duration of backpack use and the incidence of scoliosis in grade 4 and 5 Cilandak Barat 08 Elementary Schools.

Discussion

1. Relationship Backpack Characteristic and Scoliosis

The characteristics of the bags of the majority of respondents already have pads on the shoulders and also soft back pads, so that the pressure on the back can be reduced. Based on research by Mackenzie in 2003, it was reported that the use of a good bag is one that fits the individual's body, reduces the burden carried, and can also reduce the damage caused by an unfit backpack. Meanwhile, no research has been found that focuses on the characteristics of non-ergonomic bags with scoliosis. Some studies only focus on the weight of the bag that is used by each individual no more than 10%. So that the use of backpacks that are not in accordance with ergonomic standards can generally still be used, but users still have to pay attention to the characteristics of the bag in order to minimize the weight of the bag that is carried only on one part of the body. However, based on the characteristics of the bag, it is in line with previous research where many respondents experience

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musculoskeletal complaints, namely back pain when using a bag.

The number of musculoskeletal complaints in students of West Cilandak 08 South Jakarta as many as 57 respondents felt pain with a percentage of 64.8%. In this case, the majority of students have musculoskeletal complaints using backpacks with the characteristics of the bag not having a chest strap and waist strap. The highest complaints of muscle pain were in the shoulder (21.6%) and back (26.1%). Other research states that most children who carry backpacks experience low back pain and pain in the upper body involving the neck and upper back. Pain that occurs in this area is mostly associated with the use of bags with heavy loads (Yusoff, 2013).

According to WHO, musculoskeletal complaints that are left for a long time will make changes to the spine due to an imbalance in muscle work. In addition, the pain that occurs will make the body avoid the movements that make the pain arise by finding a comfortable position so that pain can be avoided. If left in an incorrect position, the body position will remain in one posture which in a long time can cause abnormalities or other musculoskeletal deformities, one of which is scoliosis.

The results of the screening using the Adam Forward Bending Test and measuring the degree of spinal inclination using a scoliometer found 18 students indicated it was leading to scoliosis so that the prevalence of scoliosis cases in that school was 20.45%. With a distribution based on gender, 9 respondents were male (50%) and 9 respondents were female (50%). Meanwhile, the age distribution in scoliosis screening was found at the age of 11-12 years as many as 14 respondents with a percentage of 77.8% which was mostly found in grade 5 with a percentage of 77.8%. The degree of slope obtained by measuring the scoliometer with ATR (Angle Trunk Rotation) scale with (5-7) was found in 13 respondents, while 4 respondents had a degree of inclination (8-9) and 1 respondent had a degree of inclination (10).

The prevalence of cases leading to scoliosis at SDN Cilandak Barat 08 is 20.4%, the use of backpacks which are widely used by students, especially grades 4 and 5 can be considered in order to reduce the incidence of chronic musculoskeletal pain so that it can be used as an external factor in minimizing the burden on the back in order to prevent the number of arch deformities. larger spine.

2. Relationship Backpack Load and Scoliosis

The weight of the bag based on the respondent's weight is still within the limits recommended by the American Chriopratic Association, which is no more than 10- 15% of the child's load. This is in line with previous research (Dumondor, Angliadi, & Sengkey, 2015) which examined all eighth grade students of junior high school found that spinal posture abnormalities with weights below 10%-15% of the child's body weight had no relationship. According to the American Academy of Orthopedic Surgeons (AAOS), the use of a backpack does not increase the risk of developing scoliosis.

It is different with research in Saudi Arabia suggesting the use of bags is only 5% of body weight. Ramprasad in his research believes that a 5% load can change the angle of the upper and lower parts of the body (Ramprasad et al, 2010). The study was in line because the students of SDN Cilandak Barat 08 found that the average use of bags was still in the mild category, which was below 10% and it was found that 11 respondents had indications leading to scoliosis and 64.8% had musculoskeletal complaints. While the use of bag weights has been recommended to be no more than 10-15%, students should be able to reduce the distribution of weight on the back by choosing the right bag. Children who carry more backpacks than recommended have a higher risk of suffering from back pain and spinal deformities. A backpack with a heavy load will cause the body to lean forward due to pressure on the back. The weight of the bag that is relatively heavier over time will affect

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the spine or the occurrence of muscle tension and spasms in the back and shoulders.

3. Relationship How to Carry The Backpack and Scoliosis

The results of statistical test analysis of the relationship between how to carry a bag and the incidence of scoliosis in this study showed that there was no significant relationship between how to wear a backpack and the incidence of scoliosis in elementary school students in grades 4 and 5, namely how to use an incorrect bag with one shoulder 4x the risk compared to with two shoulders against the occurrence of scoliosis due to the use of a backpack. While in this study, it was found that elementary school students in grades 5-6 at SD Negeri Cilandak Barat 08 were still in a good stage in terms of the majority using bags on both shoulders.

Carrying a bag using one shoulder will be at risk of musculoskeletal complaints if there is no balance of load carried between the right shoulder and left shoulder. Carrying a backpack using one shoulder will create muscle tension. The spine leans against the opposite side, pressing the mid back, ribs, and lower back on one side more than the other. This type of muscle imbalance can cause muscle tension, muscle spasms, and back pain in the short term and accelerate the development of back problems if not treated promptly.

Conclusion

The use of backpacks with inappropriate bag characteristics can still be used. This does not have a significant negative effect on posture, especially scoliosis. By following the aspect or use of a backpack that is good in terms of bag weight, duration of use, and usage, there will be no risk to posture.

Suggestion

1. For Students
   Implement the prevention of postural abnormalities by increasing the use of back bags according to applicable standards and not carrying loads that exceed the body's capacity, if necessary use a tote bag to carry excess loads.

4. For the Community
For the community, especially parents, to choose bag designs that are safe for children and provide education to children about the correct use of bags.

5. For School
Early examination of posture can be carried out in collaboration with local health services in an effort to prevent the discovery of cases of postural abnormalities from an early age. Provide a special place in the form of a cupboard, locker, or desk that has storage drawers to store books or stationery and other school necessities so that students can minimize the burden of bags brought to school. To determine the correlation between the used of bag and scoliosis, further examination (x-ray) is required.

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