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The Effectiveness of Education with Animated Videos on Knowledge of Musculoskeletal Disorders and Postural Habits in Adolescents

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ABSTRACT

Musculoskeletal disorders (MSDs) are disorders that occur in muscles, nerves, tendons, ligaments, bones, and joints. Complaints of MSDs often occur in adolescent school-age individuals, thus requiring health education through animated video media regarding early prevention of musculoskeletal disorders and ergonomic attitudes. This study aims to identify the influence of using animated videos on the level of knowledge of musculoskeletal disorders (MSDs) and postural habits and to analyze the relationship between MSDs knowledge and postural habits. This research used a Quasi-Experimental method with a pretest-posttest approach with a control group. The convenience sampling technique was used with 75 samples. Data analysis used univariate and bivariate analysis, namely with difference and cross-tabulation tests. The results of the study showed that the majority of respondents were female, 16 years old, with normal body mass index (BMI), parents' education level of high school, and income above the minimum wage. There were differences in the level of knowledge of musculoskeletal disorders (MSDs) and postural habits in the intervention and control groups, with obtained values of $p = 0.006$ and $p = 0.016$ ($p < \alpha$, $\alpha = 0.05$). There was a relationship between the level of knowledge of musculoskeletal disorders (MSDs) and postural habits, with an obtained value of $p = 0.013$ ($p < \alpha$, $\alpha = 0.05$). Thus, it is concluded that the provision of animated videos significantly influences knowledge of musculoskeletal disorders (MSDs) and postural habits.

Keywords**:** Musculoskeletal disorders; postural habits; animation video

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INTRODUCTION

One of the factors that can influence dynamism in society is health. Alongside the increasing demands of education, employment, and the economy, individuals are indirectly pressured to engage in activities beyond their physical capacity, disregarding potential issues that may arise, such as sitting in front of a computer for hours on end[1], prolonged use of gadgets [2], and resulting in reduced time for exercise to complete tasks.[3] These conditions may lead to the formation of abnormalities or disorders in the musculoskeletal system.

Disorders that occur in bones, joints, tendons, ligaments, nerves, and muscles are called musculoskeletal disorders (MSDs).[4] One common symptom of MSDs is the emergence of lesions accompanied by pain due to repetitive trauma. Worldwide, approximately 1.71 billion people experience symptoms such as lower back pain, fractures, neck pain, and others.[5] Moreover, primary healthcare services in Australia estimate that 880,000 children and adolescents in Australia experience MSD problems every year.[6] Additionally, the incidence rate of MSD disorders in Indonesia is 7.3%, with the highest incidence occurring in the 74-65 age group, followed by the 64-55 age group at 15.5% and 1.1% in the 54-45 age group.[7]

The high incidence rate above is often attributed to individuals being unaware while engaging in activities related to bone health, which can lead to abnormal bone growth, ultimately increasing the risk of MSDs such as kyphosis, lordosis, low back pain, and others. Complaints of MSDs often occur in adolescent school-age individuals. Symptoms among school students in Indonesia have been recorded several times in research journals, with 59.83% of respondents experiencing musculoskeletal complaints in the back and 6.84% of respondents experiencing complaints in the left leg due to prolonged sitting in front of a computer[1]. The use of smartphones also contributes to students' musculoskeletal complaints, with 42.9% of students experiencing symptoms of musculoskeletal disorders in the neck and 35.9% experiencing symptoms in the shoulders[2]. Therefore, the high percentage will undoubtedly decrease learning productivity and reduce the absorption rate of knowledge obtained from school.[8] To reduce complaints in the musculoskeletal system, it can be done by enhancing health education for students.

Health education can be provided from an early age so that individuals can utilize the information obtained to the fullest through practice and real-world application. As individuals mature, this can help reduce the negative impacts of activities conducted during their youth. One way to utilize various electronic media for information dissemination is through multimedia. Multimedia is a method for delivering information, consisting of knowledge, skills, and attitudes, thereby stimulating an increase in desire, mindset, and emotions.[9] In this era, the delivery of information through video media is highly popular among the public. For students, media that can display moving images and sound help alleviate boredom in conventional teaching methods and increase student engagement. Video media can be chosen for health promotion because it is considered an effective educational tool.[10]

Considering that high school students (aged 15-19 years) are at an age where physical development and activity are at their peak, it is essential to identify MSDs early during this period. The goal is to prevent the occurrence of MSDs in the future.[11] Therefore, efforts are needed to prevent high school students from

musculoskeletal disorders early on. One control measure that can be implemented is health education utilizing animated videos. Consequently, research is needed to investigate the influence of animated videos on the level of knowledge of musculoskeletal disorders and postural habits in adolescents.

METHOD

This study is a quantitative research with a quasi-experimental design utilizing a pretest-posttest with a control group. The research was conducted in Banyumas from September 2022 to February 2023. The population consisted of 1350 adolescents. The sample size for the study was 75 respondents in the intervention group and 75 respondents in the control group. Convenience sampling, was employed for sample selection..

In the intervention group, health education was provided using an animated video with a duration of 10 minutes and 21 seconds, delivered over a period of 40 minutes. Researchers reminded respondents in the intervention group to watch the video once a day via a WhatsApp group and to check a checklist for 14 days. The content presented in the video included general information about MSDs and ergonomic attitudes, complaints related to MSDs, risk factors and causes of MSDs, prevention of MSDs, and various aspects of ergonomic attitudes (such as standing posture, sitting posture, lifting posture, sleeping posture, studying posture, and smartphone usage posture). Meanwhile, the control group received no intervention.

The instruments used in this study underwent validity and reliability testing. The knowledge level instrument, consisting of 15 statement items, obtained a Cronbach's Alpha value of 0.740, indicating good internal consistency. Meanwhile, the postural habits instrument, comprising 35 statement items, achieved a Cronbach's Alpha value of 0.897, indicating excellent reliability.

Data analysis consisted of univariate analysis used to describe each respondent's characteristics through distribution. Bivariate analysis was employed to determine whether there was a significant influence on the improvement of MSDs knowledge and postural habits in the intervention and control groups using pre-test and post-test values. Difference tests were conducted to observe the difference in MSDs knowledge and postural habits values after intervention between the control and experimental groups using the Wilcoxon test. Another difference test was utilized to determine whether there was a change in the level of MSDs knowledge and postural habits before and after intervention using the Mann-Whitney test. Additionally, cross-tabulation analysis was conducted to determine the relationship between the variables of MSDs knowledge and postural habits.

This research has passed the ethical review by the Ethics Committee of the Faculty of Health Sciences, Universitas Jenderal Soedirman, with the reference number 920/EC/KEPK/XI/2022.

RESULTS

Table 1. Respondents' Characteristics

Variabel	Intervention		Control		Total	
	n	%	n	%	n	%
Gender						
Laki-laki	15	21,4	25	33,3	40	27,6
Perempuan	55	78,6	50	66,7	105	72,4
Age						
15	15	21,4	16	21,3	31	20,7
16	22	31,4	32	42,7	55	36,7
17	24	34,3	21	28,0	49	32,7
18	9	12,9	6	8,0	15	10,0
BMI						
Kurus	9	12,9	14	18,7	23	15,3
Normal	60	85,7	56	74,7	118	78,7
Obesitas	1	1,4	5	6,7	9	6,0
Father Education						
SD	16	22,9	3	4,0	19	12,7
SLTP	13	18,6	10	13,3	23	15,3
SLTA	25	35,7	33	44,0	58	38,7
D1/D3	2	2,9	4	5,4	7	4,7
S1/S2/S3	14	20,0	25	33,3	43	28,7
Mother Education						
SD	15	21,4	9	12,0	24	16,0
SLTP	13	18,6	8	10,7	21	14,0
SLTA	21	30,0	29	38,7	50	33,3
D1/D3	1	1,4	7	9,3	9	6,0
S1/S2/S3	20	28,6	22	29,3	46	30,7
Income						
Kurang UMR	31	44,3	23	30,7	54	36,0
Lebih UMR	39	55,7	52	69,3	96	64,0

Table 1 shows that this study includes male and female respondents in both the intervention and control groups among adolescents. The majority of respondents are female, accounting for 78.6% in the intervention group and 66.7% in the control group. Regarding the age characteristics of the respondents, the majority in the intervention group are 17 years old, comprising 34.3%, while in the control group, the majority are 16 years old, accounting for 42.7%. Regarding nutritional status (BMI), the majority of respondents in both groups fall within the normal category: 85.7% in the intervention group and 74.7% in the control group. Regarding the educational background of the fathers, the majority of respondents in the intervention group have completed high school (35.7%), while in the control group, the majority have completed high school (44.0%). Based on the data on the mothers' educational background, the majority in the intervention group have completed Bachelor's/Master's/Doctorate degrees (28.6%). In contrast, in the control group, the majority have completed high school (38.7%). Regarding parental income characteristics, most respondents in the intervention group have income levels above the minimum wage (55.7%). In contrast, in the control group, the majority have income levels above the minimum wage (69.3%).

Based on Table 2, the Wilcoxon test results indicate a difference in the level of knowledge of MSDs between the pretest and posttest.

Table 2. Difference in Pretest and Posttest Knowledge Levels in the Intervention and Control Groups with the Wilcoxon Test

Variabel		*Pretest*				*Posttest*			*Wilcoxon*
	n	Low	Medium	High	n	Low	Medium	High	*p-value*
Tingkat Pengetahuan									
Intervention	70	14,3	61,4	24,3	70	11,4	32,9	55,7	0.006
Control	75	9,3	60,0	30,7	75	1,3	74,7	24,0	0.704

The analysis suggests that there is a significant difference in the knowledge of MSDs among respondents before and after receiving the animated video in the intervention group, with a p-value of 0.006 ($p < \alpha$, $\alpha = 0.05$). The analysis for the control group concludes that there is no significant difference in the level of knowledge of MSDs among respondents before and after, with a p-value of 0.704 ($p > \alpha$, $\alpha = 0.05$).

Table 3. Difference in Pretest and Posttest Knowledge Levels between Intervention and Control Groups Using Mann-Whitney Test

Variabel	Intervention		Control		Total		Mann-Whitney
	n	%	n	%	n	%	*p-value*
Tingkat Pengetahuan							
Pretest							
Low	10	14,3	7	9,3	17	11,4	
Medium	43	61,4	45	60,0	92	61,3	**0,270**
High	17	24,3	23	30,7	41	27,3	
Posttest							
Low	8	11,4	1	1,3	9	6,0	
Medium	23	32,9	56	74,7	82	54,7	**0,005**
High	39	55,7	18	24,0	59	39,3	

Based on Table 3, the results of the Mann-Whitney test indicate a difference in the level of knowledge of MSDs after being provided with animated video media in both the intervention and control groups. Based on the analysis results, it can be concluded that there is a significant difference in the knowledge of MSDs among respondents in the intervention and control groups after being provided with animated videos in the intervention group, with a p-value of 0.005 ($p < \alpha$, $\alpha = 0.05$). The analysis of data before treatment suggests that there is no difference in MSDs knowledge between the intervention and control groups, with a p-value of 0.270 ($p > \alpha$, $\alpha = 0.05$).

Table 4. Difference in Pretest and Posttest Postural Habits between Intervention and Control Groups Using Wilcoxon Test

Variabel	*Pretest*			*Posttest*			*Wilcoxon*
	n	Bad	Good	n	Bad	Good	*p-value*
Postural habits							
Intervention	70	8,6	91,4	70	4,3	95,7	0.016
Control	75	3,9	90,7	75	16,0	84,0	0.100

Based on Table 4, the results of the Wilcoxon test indicate a significant difference in the postural habits values among respondents before and after being provided with animated videos in the intervention group, with a p-value of 0.016 ($p < \alpha$, $\alpha = 0.05$). The analysis for the control group concludes that there is no significant difference before and after, with a p-value of 0.100 ($p > \alpha$, $\alpha = 0.05$).

Table 5. Difference in Pretest and Posttest Postural Habits between Intervention and Control Groups Using Mann-Whitney Test

Variabel	**Intervention**		**Control**		**Total**		**Mann-whitney**
	n	**%**	**n**	**%**	**n**	**%**	***p-value***
Postural Habits							
Pretest							
Bad	6	8,6	7	3,9	14	9,3	0.270
Good	64	91,4	68	90,7	136	90,7	
Posttest							
Bad	3	4,3	12	16,0	15	10,0	0.005
Good	67	95,7	63	84,0	135	90,0	

Based on Table 5, the results of the Mann-Whitney test suggest that there is a significant difference in the postural habits values between the intervention and control groups after being provided with animated videos in the intervention group, with a p-value of 0.005 ($p < \alpha$, $\alpha = 0.05$). The analysis of data before the intervention indicates that there is no difference in the postural habits among respondents in the intervention and control groups, with a p-value of 0.270 ($p > \alpha$, $\alpha = 0.05$).

Table 6. Relationship between Knowledge Levels of Musculoskeletal Disorders (MSDs) and Postural Habits

Variabel	*Habits_Posttest*				Total		*Sperman rank*	
	Bad		Good					
	n	%	n	%	n	%	*p-value*	*r*
Low	1	0.7	8	5.5	9	6.2		
Medium	13	9.0	66	45.5	79	54.5	0.013	0.206
High	1	0.7	56	38.6	57	39.3		
Total	15	10.3	130	89.7	145	100.0		

Based on Table 6, it is evident that there is a weak correlation between the knowledge levels of MSDs and postural habits after being provided with animated video media in both the intervention and control groups, as indicated by the correlation coefficient of 0.206. Based on the analysis results, it can be concluded that there is a significant relationship between the knowledge levels of MSDs and postural habits in both the intervention and control groups after being provided with animated videos in the intervention group, with a p-value of 0.013 ($p < \alpha$, $\alpha = 0.05$).

DISCUSSION

Difference in Knowledge Levels of Musculoskeletal Disorders (MSDs) Pretest and Posttest After Providing Animated Videos

He distribution of characteristics of pretest knowledge levels of MSDs shows that the majority of respondents in the intervention group are categorized as having moderate knowledge, accounting for 61.4%, while in the control group, 60.0% are also classified as having moderate knowledge. This suggests that respondents already possess a general understanding of muscle and bone disorders, which may have been acquired through Physical Education and Health classes during sports activities or lessons in school. Additionally, respondents may have obtained information from various sources such as the internet, social media, television, or other book sources. Consistent with the study by Kurniawati (2019), it indicates that some respondents have previously sought information themselves through the internet, although not necessarily in-depth or intensively.[12]

Based on the posttest data of MSDs knowledge levels, the majority of respondents in the intervention group are classified as having high knowledge, accounting for 55.7%, while in the control group, 74.4% are categorized as having moderate knowledge. The increase in MSDs knowledge levels among respondents after being provided with animated videos, lasting 10 minutes and 21 seconds, for a total duration of 40 minutes over 14 days, is likely due to the focused information delivery in the animated video, which aligns with scientific knowledge. The provision of animated videos has the potential to enhance students' knowledge of MSDs. This finding is consistent with the study by Febriana, Devi Artanti, and Rusilanti (2020), which demonstrates that knowledge increases after intervention through video media in the intervention group compared to the control group, which has lower scores.[13]

After the intervention with animated video media, there was an increase in knowledge about musculoskeletal disorders (MSDs) among some respondents, indicating an improvement in MSDs knowledge levels before and after being provided with animated video media. This research finding is consistent with the results of a study conducted by Setiani and Warsini (2020), which showed that health promotion using videos is more effective in increasing prevention of musculoskeletal disorders (MSDs).[14]

This occurs because before conducting the posttest, respondents are first provided with an intervention using video media. Findings from the study by Karama et al. (2022) also demonstrate that before receiving the intervention, individuals had insufficient or moderate knowledge, but after the intervention, there was a significant increase in knowledge.[15]

The difference in postural habits between the pretest and posttest after the provision of animated videos.

The research findings indicate that the majority of respondents in both the intervention and control groups fall into the "good" category, each comprising 91.4%. It appears that respondents' postural habits before receiving the intervention were already good. This may be because students have acquired information from various other sources such as the internet, teachers, parents, or other sources regarding general information on good ergonomic behaviors like standing, sitting, lifting, sleeping, and studying. This finding aligns with the research conducted by Febriana, Devi Artanti, and Rusilanti (2020), which suggests that habits, whether positive or negative, can be absorbed by individuals through social media, wherein they imitate the behaviors of others through imitation or repetition.[13]

Posttest data on postural habits characteristics reveal that the majority of respondents in the intervention group, comprising 95.7%, experienced an improvement, while the majority in the control group, accounting for 84.0%, experienced a decline compared to the pretest data. The decrease in postural habits scores from the pretest to the posttest in the control group occurred because the students filled out the posttest questionnaire during a school holiday when there was no supervision from the researchers. Additionally, there was a gap between the pretest and posttest data collection, during which the students did not receive appropriate information regarding MSDs knowledge, resulting in a decline in MSDs knowledge scores. This finding is consistent with the study conducted by Ramdoni and Fahrudin (2020), which showed that the control group, provided with leaflet intervention, experienced a decrease in knowledge compared to the intervention group, which received counseling using videos about bullying and experienced an improvement.[16]

Supported by the research conducted by Suhariyati, Hardiani, and Rahmawati (2016), there was a decrease in posttest scores in the control group due to limited information and lack of intervention.[17] The provision of animated videos to respondents has been effective in improving their postural habits. With the increase in students' knowledge levels of MSDs, their postural habits also improve. The engaging and informative nature of the animated videos ensures that the information is effectively conveyed to the respondents, prompting them to immediately put the acquired knowledge into practice to improve their postural habits. Previous research conducted by Setiyowati and Hartati (2022) has shown a significant relationship between high knowledge and the behavior of adopting good ergonomic positions, which can help reduce back pain complained about by students.[18]

After being provided with intervention through animated video media, there was an improvement in the postural habits of the respondents, indicating an increase in postural habits from before to after the provision of animated video media. Statistical analysis results indicate a significant change in postural habits before and after the provision of animated video media. This finding is consistent with the study conducted by Novitarini and Qomar (2021), which showed that videos can change respondents' habits in using long-term contraceptive methods [19]. In line with the research conducted by Lestari, Nurhaeni, and Hayati (2018), which indicates that there is a difference between the intervention group and the control group. This difference arises because the control group did not receive intervention in the form of mobile video.[20]

The Relationship Between The Knowledge Levels Of Musculoskeletal Disorders (Msds) And Postural Habits

The cross-tabulation results show that respondents with a high level of knowledge of MSDs and good postural habits are 56 (38.6%), while those with moderate knowledge of MSDs and good postural habits are 66 (45.5%). The Spearman's rank correlation coefficient is 0.204, indicating a weak correlation with a positive direction. This means that as the level of knowledge of MSDs increases, the postural habits of participants also improve, and vice versa.

Knowledge is the result of human curiosity about various things through specific methods and tools. Knowledge can be obtained through both formal and non-formal education. Generally, the higher a person's

level of education, the easier it is for them to receive information and acquire knowledge. A high level of knowledge will also influence behavioral activities in daily life, including activities related to postural habits.

With a high level of knowledge of MSDs, students' postural habits also improve because they already know how to stand, sit, lift objects, and sleep correctly in their daily activities. This is consistent with previous research conducted by Merita and Junita (2021), which showed significant results indicating a relationship between knowledge and fatty food habits. Therefore, it can be concluded that there is a positive correlation between knowledge and habits.[22] This result also supported by previous research conducted by Jauziyah et al. (2021), which showed significant and positive results indicating a relationship between high nutritional knowledge and the eating habits of UNDIP students.[23]

CONCLUSION AND RECOMMENDATIONS

This research aimed to examine the influence of using animated video media on the level of knowledge of musculoskeletal disorders (MSDs) and postural habits among adolescents in Banyumas. The conclusion drawn from the study is that there is a difference in the values of the level of knowledge of musculoskeletal disorders (MSDs) and postural habits, and there is a relationship between the level of knowledge of musculoskeletal disorders (MSDs) and postural habits. It is hoped that adolescents can be provided with information about early prevention of musculoskeletal disorders (MSDs) using video media in their surroundings and can promote the use of animated video media to improve the level of knowledge of musculoskeletal disorders (MSDs) and postural habits among adolescents who are currently in school to prevent musculoskeletal disorders.

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