Effects of Health-Related Fitness Model to Improve Physical Fitness and Physical Activity in Vocational High School Students

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Abstract  Physical activity and physical fitness have a vital role in enhancing a healthy and active lifestyle for individuals. This study aimed to see the impact of providing a health-related fitness model on physical improvement and vocational high school students' physical activity. The experimental method with randomized control group pretest-posttest design was applied in this research. The sample selection was based on random cluster sampling to select two classes as the experimental group and the control group consisting of 33 students each, with an age range of 16-17. The instruments used in this study were physical fitness test instruments and students' physical activity tests. The data analysis technique used the Mann-Whitney test and t-test to determine the difference in influence between the experimental and control groups. The results showed that overall, the two groups had a positive impact on the improvement of students' physical fitness and physical activity. However, the experimental class showed a significant increase compared to the control class on the physical fitness variable. Meanwhile, in the physical activity variable, there was no significant difference between the two groups. From these findings, the researchers concluded that the health-related fitness model and the direct instruction model could be applied as an alternative for teachers to improve physical fitness and physical activity for vocational high school students. Furthermore, the researcher explicitly suggests the use of health-related fitness models to improve students' physical fitness.

Keywords  Health-Related Fitness, Physical Fitness, Physical Activity

1. Introduction

A healthy and active lifestyle is not just a campaign echoed by health activists. However, individuals must maintain their quality of life and avoid various diseases such as hypertension, diabetes, obesity, etc. [1]–[3]. A healthy and active lifestyle has a positive correlation with physical activity and new fitness. However, nowadays, the challenges in maintaining a lifestyle are getting heavier with the advent of technology such as smartphones, which indirectly make them lazy to move as they get attached to
these devices [4], [5]. Although smartphones have many benefits and are becoming increasingly sophisticated and multifunctional, studies have identified some potential associated risks, especially among young smartphone users [6], [7]. Addiction to smartphones carries dangerous consequences for user safety and can have negative implications [8]. This factor becomes the driving factor in the decline in adolescents' active lifestyles even though many individuals have felt the benefits of being physically active. For example, adults who engage in regular physical activity during leisure time are less likely to have health problems such as obesity, high blood pressure, and diabetes than those who are inactive [9], [10]. Furthermore, it is recommended that school-age children and adolescents should engage in 60 minutes or more of daily physical activity. However, recent evidence suggests that adolescents' physical activity has decreased, and activity among adolescents in some countries remains relatively low [11], [12]. Therefore, there are some essential needs for effective interventions which promote health and physical activity participation among adolescents.

As a compulsory subject at schools, physical education has a role in promoting health and offering adolescents opportunities to participate in physical activities [13], [14]. However, several previous studies revealed that school physical education programs do not provide adequate physical activity for adolescents [15], [16]. The availability of many entertainment technologies and environmental factors that are not supportive also encourage sedentary adolescent lifestyles and contributes to the decline in one's physical fitness [17], [18]. Physical fitness itself is a set of people's characteristics that are positively correlated with their physical activity and is a goal of physical education [17].

Vocational high school students are demanded to be able to master skills that can be directly applied when they work in companies later. These students need initial capital in order to have more power and strength to do their activities. Besides, the need to increase fitness and physical activity also encourages students to have the initial capital to protect them from various diseases and increase their self-confidence to avoid various health problems in the future. Darst, et al [19] revealed that many people do not join community sports, exercise in gyms, or participate in other sports organizations because of their lack of competence in physical abilities, and fear of embarrassment. Therefore, the increase in students' physical activity and physical fitness in schools needs to be designed in the learning process. The provision of appropriate learning models in improving students' fitness and physical activity needs to be considered by schools since good fitness makes students more confident in carrying out activities and having a positive impact on their lives. In this study, researchers offered solutions to improve students' physical fitness and physical activities by applying the health-related fitness (HRF) model.

The health-related fitness (HRF) model is a learning model that can be integrated with physical education to provide knowledge and habituation to practice physical activities for children at school. This model assumes that physical activity is the core of a healthy lifestyle. The development of such a lifestyle requires knowledge of physical fitness, which includes the relationship between activity and health, healthy physical skills, and commitment to the virtues of exercise. In this model, students must have self-management as an effort to formalize activities to make them have habits related to fitness training that is more meaningful to students in physical education settings [20], [21].

The health-related fitness model has a goal consisting of five stages that are in line with students' development and growth. First, doing exercises regularly, includes learning personal habits and learning to practice them regularly, and enjoying them. Second, obtaining fitness criteria for physical fitness components related to health and learning to create realistic personal physical fitness goals. Third, physical fitness patterns include choosing personal activities and evaluating exercise and exercise programs. Fourth, self-evaluation includes testing one's fitness and translating test results. Fifth, solving problems and making decisions such as planning a physical fitness program and becoming a knowledgeable doer. The HRF model's characteristics emphasize knowledge, attitudes and behaviors, a continuous program of activities, and regular testing and individual assessment.

Several studies on Health-Related Fitness have been carried out by previous researchers, such as examining the relationship between Health-Related Fitness indicators including cardiovascular fitness and body mass index, and academic performance to high school graders which gave a positive but small relationship [22]. Another study was conducted by Brusseau [23]. He examined the effect of the Comprehensive School Physical Activity Program (CSPAP) on physical activity and health-related fitness to 1390 children from kindergarten to elementary school students in grade 6 with low family income. The result showed that CSPAP carried out to 12 weeks was able to increase physical activity and HRF. However, the magnitude of the effect was weak to moderate category. Furthermore, Hastie [24] in his research which aimed to develop the physical fitness of 5th grade elementary school students by combining Project-Based Learning (PBL) and health-related fitness (HRF) showed evidence that supports the effectiveness of the PBL-themed fitness education unit. Another study was conducted by Britton [25] which investigated the role of Perceived Athletic Competence (PAC) and Health-Related Fitness (HRF) in mediating the interrelationship between Motor Competence (MC) and Physical Activity (PA) during a child's transition from primary to secondary school. It was found that there was a stronger relationship through HRF.
compared to PAC to MC-PA, and that HRF was a more substantial mediator of the MC-PA relationship during the school transition period. The Health Related Fitness (HRF) model has been widely used to promote healthy behavior and the adoption of a healthy lifestyle in order to maximize physical activity during the lessons and keep students physically active for at least 50% of class period [26]. In this study, the researcher wanted to see an overview of the health-related fitness model's application as a form of promotion of fitness education by adjusting the applicable curriculum in Indonesia. Furthermore, this study aimed to investigate the effectiveness of applying the health-related fitness model to increase physical fitness and physical activity for vocational high school students.

2. Materials and Methods

This study's research method was an experimental method with a randomized control group pretest-posttest design [27]. The sample selection used random cluster sampling to select two classes as the experimental and control groups with an age range of 16-17. The experimental group consisted of 33 students. They were treated with the health-related fitness learning model, while the control group consisting of 33 students was treated with the direct instruction learning model. All participants from the two groups attended physical education learning with a 90-minute session for four weeks. The experimental group was carried out for 12 meetings and held three times a week for one month. Whereas, the control group was given treatment using the direct instruction learning model that physical education teachers commonly use by following the school's lesson schedule.

The instruments used in this study were the Indonesian Physical Fitness Test (TKJI) which included a 60-meter running test, a 60-second pull-up test, a 60-second sit-up test, a vertical jump test, and a 1200-meter running test [28]. The second instrument is the International Physical Activity Questionnaire (IPAQ) to determine students' level of physical activity [29].

The data analysis technique used in this study was the Mann-Whitney test on the abnormally distributed data group. Simultaneously, the t-test was carried out on the normal and homogeneous distributed data group to determine the differences in the pre-test and post-test results between the two groups.

3. Result

This study aimed to determine the impact of giving a health-related fitness model on improving student's physical fitness and physical activity. Based on the research results, information was obtained about the data description of the results of measurements of students' physical fitness and physical activity as shown in table 1.

Based on table 1, it can be seen in the experimental group that the results of students' physical fitness and physical activity have increased from the pre-test and post-test results; the physical fitness from an average of 12.48 to 18.42, while the physical activity of students from 12.84 to 14.61. The control group also experienced an increase in the pre-test and post-test results; the physical fitness from an average of 8.85 to 13.15, while the physical activity of students from 12.48 to 15.15. In summary, the increase in the pre-test and post-test results in the two groups can be seen in Figure 1.

| Variable       | Experimental Group | Control Group |
|----------------|---------------------|---------------|
|                | Pre-test  | Post-test  | Pre-test  | Post-test  |
| Physical fitness | 12.48±1.50  | 18.42±1.30  | 8.85±0.87 | 13.15±0.97  |
| Physical activity | 12.84±3.37  | 14.61±4.05  | 12.48±2.86 | 15.15±3.38 |
In Figure 1, it can be seen that in the experimental group, the average student's physical fitness increased by 5.94, which is higher than the average increase in the control group, which got a mean score of 4.3. However, the mean increase in students' physical activity in the experimental group was 1.77, smaller than the control group with 2.67. Furthermore, to determine the significance of the increase in the pre-test and post-test results, the Mann-Whitney test was performed on data with an abnormal distribution and t-test on data that were normally distributed and homogeneous.

Based on table 2, information is obtained about the Mann-Whitney test results in the experimental group. The calculation of the student's physical fitness showed a value of 2.000 with an Asymp value sig. of 0.000, which means that there is a significant difference. Meanwhile, students' physical activity was carried out by calculating the t-test, which obtained a score of -8.028 with a sig value of 0.000, which means that there is a significant difference. Furthermore, in the control group, the Mann-Whitney test was performed which obtained 0.500 for physical fitness and 0.003 for physical activity with the Asymp value sig. of 0.000. It means that there is a significant difference. This result means that overall there is an effect of applying the health-related fitness model and the conventional model on improving student's physical fitness and physical activity. Furthermore, to determine the significance of the differences between the two groups, the Mann-Whitney test and t-test were performed, as shown in table 3.

| Group       | Physical fitness | Remark | Physical activity | Remark |
|-------------|------------------|--------|-------------------|--------|
|             | Mann-Whitney     | Asymp. Sig. | Mann-Whitney     | Asymp. Sig. |
| Experimental| 2.000            | .000   | Sig -8.028*       | .000* sig |
| Control     | .500             | .000   | Sig 315.000       | .003 sig |

*t-test was employed because data are homogenous and normally distributed

Based on table 3, it can be seen that the physical fitness variable after analysis using the Mann-Whitney test shows a value of 2.000 and an Asymp value sig. of 0.000, which is smaller than 0.05. It means that there is a significant difference between physical fitness results in the experimental group and the control group. Furthermore, the physical activity variable using the t-test shows a sig. value of 0.565, which is greater than 0.05, meaning that there is no significant difference in physical activity results in the experimental and control groups. Therefore, the health-related fitness model's application is proven to be more effective than conventional models in improving physical fitness. However, physical activity did not show....
a significant difference.

4. Discussion

In this study, it was proven that students who were given the health-related fitness (HRF) model experienced better physical fitness improvement than the group that applied traditional methods. However, there was no significant difference in the physical activity variable between the two groups. Findings in the field reveal that students in the experimental group also understood the application of the health-related fitness model. They were also actively involved in practice at the time of learning with a structured physical education program designed to improve health-related fitness, promote movement skills, and lead to success and pleasure in learning activities. Other findings in the field reveal no significant difference in the physical activity of students in the experimental group and the control group because of the limitations of researchers in controlling activities outside of learning at school. During school hours, the control group only received a conventional learning model at school. However, after being given a physical activity questionnaire, it turned out that some of them were involved in extracurricular activities as well as training in amateur sports clubs outside school, so that there was no difference in physical activity between the two groups. This situation certainly has a good impact on promoting physical activity, according to some previous studies. The studies revealed that although many young people are more active than adults, most of them have a lower physical activity level than recommended for good health [15], [30].

In line with this study's results, previous research revealed that implementing health-related fitness gives students more opportunities to participate in special exercises and games designed to promote sustainable fun and participation [31]. Furthermore, the competence and physical activity that students perceive is influenced by other factors such as the experience of success or failure in games, teacher attention, motivation, and interactions in the classroom with peers [32]–[35]. The strategy of providing the HRF model applied to physical education learning at schools has a significant impact on student's physical fitness and physical activity. In the HRF model, the types of subject matter are adjusted to the types of subjects listed in the curriculum. The number of hours of compulsory/ intra-per-week lessons as stated in the curriculum (for example, 2 x 45 minutes) is adjusted by dividing it into meetings that support fitness development (into 3 x 30 minutes). Furthermore, the provision of theoretical material is emphasized so that it is conveyed in an integrated manner in direct practice. This application is in line with previous research suggestions that reveal that schools' physical education learning curriculum should maximize physical activity during lessons and keep students active for at least 50% of the class time [36].

The application of learning models, especially the health-related fitness (HRF) model, is essential to be applied from an early age to instill habits to maintain health. This statement is reinforced because having good physical fitness and regular physical activity are essential components of a healthy lifestyle for children and adolescents [37]–[40]. Furthermore, efforts to train physical fitness at schools can be made by maximizing physical education lessons with curriculum adjustments. This curriculum should maximize physical activity during lessons and keep students active for at least 50% of the class time [36]. Researchers have suggested that behavior change is a dynamic process and involves several factors: motivation, perceived inhibition, enjoyment, stages of change, and social support [41]–[45]. Previous studies have also reported that physical activity combined with a behavior modification approach can effectively increase short-term and long-term physical activity of adolescents [46]–[48].

5. Conclusions

Based on the results obtained, the researcher concluded that both the health-related fitness model and the direct instruction model could positively affect vocational high school students' physical activity and physical fitness. However, all students in the experimental group experienced a more significant increase than students in the control group regarding students' physical fitness. These findings are vital for physical education teachers to fully understand the problems related to student's physical fitness and physical activity. The statement, as mentioned earlier's rationale is to develop effective interventions so that physical educator learning implemented at schools can promote students to improve student fitness by utilizing health-related fitness programs and developing a fun learning environment.

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