Improving Nutrition Education and Physical Fitness in High School Through a Community-Based Haheho Apps Intervention

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Abstract
With the rise of sedentary lifestyles post-COVID-19 pandemic and the adverse effects of handphone use and unhealthy eating habits among high school students, teachers and staff, there is an urgent need for innovative interventions that promote nutrition education and physical activity. So far, several conventional approaches have not shown significant results. This study addresses the need for school communities to initiate active and healthy lifestyle changes by utilizing mobile technology through a school community-based Haheho Apps intervention. Methods: Experimental study with one group pretest-posttest design involving 256 students aged 15-18. 21 teachers and school staff aged 30-58 years old, participants will receive access to community-based Haheho Apps for 8 Weeks focusing on nutrition education and physical activity. Student, teacher and school staff groups receive age-appropriate materials and physical activities. Pre- and post-intervention assessments will measure changes in nutrition knowledge, BMI, and physical fitness. 277 participants consisting of students, teachers, and school staff took the pretest and posttest; participants showed improved nutrition knowledge, BMI, and physical fitness. Statistically significant decreases and increases were recorded overall: a significant reduction in BMI of 42% in the obese group, an increase in BMI of 33% in the less-than-ideal group, and 25% had no change. The Haheho Apps intervention based on the school community is efficacious in improving school community members' knowledge, BMI, and physical fitness.

Keywords: Physical Activity, Knowledge Nutrition, Physical Fitness, Community-Based

Introduction

Every year, the country spends trillions of rupiah to handle public health and health insurance. In fact, if public health is well maintained, starting with instilling, getting used to, and providing knowledge about how to live an active and healthy life from an early age, then the country will be able to save the health budget and divert health subsidies to the development sector (Kristiyanto, 2021).

The health and fitness of school community after the pandemic experienced a tremendous decline. The results of the 2021 Sports Development Index (SDI) report from the Ministry of Youth and Sports of the Republic of Indonesia, randomly selected in 34 provinces, showed a significant decline in physical fitness. It was found that "the fitness level in the very poor category reached 53.63%, the poor category was 22.68%, and only 5.86% were in the very good and superior categories. There was generally no significant change compared to the 2006 SDI data. Although there was an increase in the good and very good categories, there was an increase in the very poor category." (Mutohir et al., 2022). This shows that physical fitness continues to decline. Based on the results (Ministry of Health, 2018) measurement in Indonesia, 8.7% of children aged 13–15 years are malnourished (1.9% are skinny and 6.8% are thin), while 16% are overweight (11.2% are obese and 4.8% are very obese). Based on the results of a multistage fitness test conducted on students at SMA Negeri 1 Kesesi, involving 277 samples including teachers, staff, and students, it was found that 102 people were in the very poor category, 68 people in the poor category, 76 people in the sufficient category, 31 people in the good category, and 15 people in the very good category. In addition, 56.8% of students' Body Mass Index (BMI) were in the normal category, 36.5% in the underweight category, and 6.7% in the overweight category.

The education sector is important in preventing and providing knowledge to school community so that they can have an active and healthy lifestyle throughout life. In an effort to restore the condition of education services and restore the learning process after the COVID-19 pandemic, the Ministry of Education and Culture instructed policymakers in schools as task implementers in the field to create strategies and plans for the recovery of educational services that are structured, systematic and massive involving various parties who have resources power to encourage learning recovery, encourage school community to maintain health by reducing the risk of diseases such as heart disease, stroke, and diabetes, and equip school community to have knowledge of balanced nutrition and calculate daily calorie needs.

The use of applications in the world of education today could be a solution, considering that currently, everyone cannot be separated from gadgets. A more in-depth application technology approach can assist teachers, administrative staff, and students implement learning and exercise programs to improve physical fitness and health. This statement is in line with what was expressed by Tjandrawina (2016). In The Economist Intelligence Unit, 50% of doctors believe that smartphone application technology empowers patients so that they can play a role in managing their health proactively. Physical fitness can help fight COVID-19. According to the statement (Costa et al., 2022) there is a possibility that someone who does not have good physical fitness will appear and cause complications and problems that will be more serious if someone experiences a COVID-19 infection. Therefore, appropriate training is required to increase physical fitness. According to Helmy (2015), training is a type of physical activity that is planned, structured, and repetitive and aims to increase or enhance the physical fitness's constituent components.

Several studies also show positive results. As per research conducted (Okinarum et al., 2017) "There is an increase in mothers ' knowledge of implementing the consumption of a variety of balanced nutrition food for elementary school children before and after using the (SEHATI) application."

According to Florian and Hurych (2022), high-intensity interval training is a type of exercise regimen characterized by short intervals of time considered strenuous. According to Bauer and colleagues (2022) there are several benefits associated with HIIT training, including more control over training and a more systematic approach since it makes it easier for students to understand their daily progress and increases potential energy more quickly than other conditioning methods. Additionally, the program can be completed almost anywhere and does not require specialized training. Physical exercise is considered the primary means of promoting health and protecting the body from various illnesses (Garber et al., 2011).

These conditions motivated the author to create an innovative work the Haheho Apps. Haheho Apps is an Android-based application that includes sports training guides and fitness monitoring and is able to collect fitness data. Various features can increase the school community's knowledge regarding diet and balanced nutrition. Application technology can more deeply assist teachers, students, and school staff in implementing fitness training programs and learning nutrition education.

Method

Methods used in the study This is an experiment. Research experimental considered their own level of the highest certainty. Sugiyono (2017) explain that method study this is used to look for influence treatment certain to other variables in controlled conditions. Researchers predict the study in accordance with the type of research that was developed, namely study quasi-experimental, with the use of the application Heheho App as variable independent, and physical fitness, knowledge nutrition, and body mass index as variable dependent.

Design used in study this is "one group pretest- posttest design." by specific, design study this involves a pretest before given treatment, and posttest after a given use haheho app for 2 months treatments. Although own potential design this sometimes criticized because its instability, such as lack of group control (Groesz et al., 2002). However, Shek and Sun (2012) explain the design this still often used because its practicality and simplicity in lots methodology study. In addition, research quasi-experimental, including pretest - posttest design, very suitable for evaluate new initiatives and programs in environmental education (Zajić et al., 2022).

Agustianti and colleagues (2022) state that results can be known more accurately because they can be compared before and after treatment. Research This will compare pretest results before the use of the application Haheho and post-test physical fitness, nutrition knowledge at SMAN Kesesi.

Data collection techniques were carried out with stage blended learning, namely online and offline learning, which look at face-to-face and online meetings through the Google Meet application. Researchers explain in a short way the use of the Haheho application, then give task movement to students in the form of 18 treatments or exercises in the Haheho application. Instrument in study this is the Multistage Fitness Test (MFT) tool, also known as a MFT (Fenanlampir & Faruq, 2015). MFT Test was carried out with the request of students

to run back and forth, or shuttle runs between two measured lines using meters and limited by cones that are 20 meters apart. Students must run from cone First to cone second while hearing the "beep" sound at the desired tone of their own bleep test rhythm.

For the measurement of nutrition knowledge, quizzes and questionnaires were used to determine activities carried out by the community school for 18 training sessions, which were collected via Google Forms. Instrument this includes a question with a scale response, namely a question for a general summary from the respondent about contents questionnaire.

The body mass index (BMI) is measured by measuring the weight and height of students. Weight measurement uses a digital scale, while height is measured using a standard height-measuring tool. After the weight and height data are obtained, BMI is calculated using the formula weight (in kilograms) divided by height (in meters) squared. This body mass index is used to determine the nutritional status of students, whether they are included in the thin, normal, or obese categories according to the standards set by WHO.

Treatment

The treatment was carried out 18 times in the form of interval training using the Haheho application media, which must be carried out by the school community 18 times. Some of the features of the Haheho application include: (1) An exercise guide menu that functions to guide users in doing exercises to stay safe in accordance with the FITT and SMART principles; (2) an exercise monitoring menu that functions to monitor sports training programs starting from pre-exercise, 18 exercises, post-exercise, to printing fitness certificates; (3) BMI menu to calculate body mass index. (4) Nutritional material that functions to provide training on nutrition. All of this training is directly connected to the LMS; (5) Quiz is menu functions to evaluate the extent of the school community's understanding of physical fitness and nutritional material; (6) The exhibition menu functions as a tool to harvest learning outcomes by exchanging ideas and experiences while running training programs.

The stages of treatment are as follows:

Table 1: Phase *Treatment*

No.	Phase	W Duration
1	Socialization of Multistage Fitness Test, Balanced Nutrition, Use of Haheho Apps	1 session
2	*Pretest*	1 session
3	The treatment was given 18 sessions of movement task training and learning nutrition on LMS	18 sessions practice through project assignments and fill in practice progress
4	*Post Test*	1 session

Giving treatment of 18 exercises of movement tasks to be carried out by school citizens for 2 months in the media Haheho App.

Results and Discussion

Pre Test Results

Before starting treatment, a pretest is carried out to see the student's initial physical fitness level using the Multistage Fitness instrument. Then, the following data is obtained:

Table 2: Statistic Data Description *Pre-test*

Variables	N	Min	Max	mean	Standard deviation
Physical fitness	277	26.4	69.5	44.4	11.1
Knowledge nutrition	277	30	87	60.3	10.2
BMI	277	13	34.6	20.2	3.6

Source: SPSS 26.0 *for Windows*

Table 3: Statistic Data Description *Post-test*

Variables	N	Min	Max	mean	Standard deviation
Physical fitness	277	33.3	69	51.9	11.1
Knowledge nutrition	277	49	100	85.5	7.4
BMI	277	14	34	20.1	3.1

Source: SPSS 26.0 *for Windows*

Based on the results of the statistical data analysis descriptive in the pre-test and post-test, there was a significant change in physical fitness on knowledge of nutrition and body mass index (BMI) of respondents after the intervention. In the pre-test, the physical fitness participant's own range mark is between 26.4 and 69.5, with an average of 44.4 and a standard deviation of 11.1, which indicates the existence of variation between participants. After the intervention, in the post-test, the physical fitness increased with a range mark between 33.3 and 69, and the average increased to 51.9, while the standard deviation remained at 11.1. This shows that improvement in the physical fitness happens to every participant, especially for those with the lowest mark.

Knowledge of nutrition also experienced significant improvement. In the pre-test, the nutrition knowledge score ranged between 30 and 87, with an average of 60.3 and a standard deviation of 10.2. After intervention, on post-test, the value knowledge of nutrition increased in the range of 49 to 100, with an average of 85.5 and a standard deviation decrease to 7.4. The decreased standard deviation indicates that improved nutrition knowledge is more evenly distributed among participants.

For BMI, changes are not too significant. In the pre-test, the BMI value ranged from 13 to 34.6, with an average of 20.2 and a standard deviation of 3.6. After intervention, span BMI values range from 14 to 34, with a slightly higher average. Decreased to 20.1, and the standard deviation decreased to 3.1. Although BMI changes are insignificant, the decreased standard deviation shows that BMI variation between participants is slightly reduced after the intervention. Overall, intervention Is effective in increasing physical fitness and knowledge of nutrition, although the impact on BMI tends to be minimal.
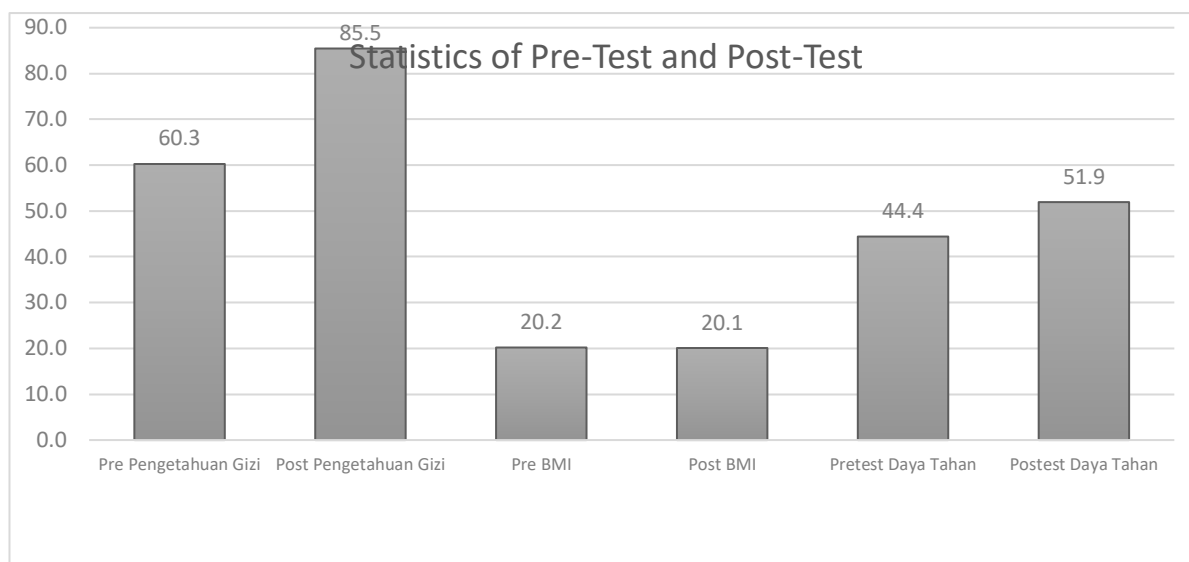
Figure 1: Statistics of Pre-test and Post-test

Table 4: Normality Kolmogorov-Smirnov [a]

Variables		Statistics	Sig
Physical Fitness	Pre	.121	.000
	Post	.173	.000
Knowledge	Pre	.048	.200 [*]
	Post	.095	.000
BMI	Pre	.163	.000
	Post	.380	.000

A non-parametric normality test using the Kolmogorov-Smirnov Test showed that most of the data was not normally distributed. For the physical fitness variable, both in the " Pre " condition (before intervention) with a statistical value of .121 and significance of .000, and " Post " (after intervention) with a statistical value of .173 and significance of .000, the data were not normally distributed. Likewise, the BMI variable showed abnormality both in the " Pre " condition, with a statistical value of .163 and significance of .000, and " Post " with a statistical value of .380 and significance of .000. Meanwhile, the knowledge variable only showed a normal distribution in the " Pre " condition with a statistical value of .048 and significance of .200. In contrast, in the " Post " condition it was not normally distributed with a statistical value of .095 and significance of .000.

Hypothesis Testing

Table 5: Wilcoxon Non-parametric Paired Test Table (Sample 277 students)

Variables	Z	Asymp. Sig. (2-tailed)
BMI	-3.048 [b]	.002
Knowledge Nutrition	-14.663 [b]	.000
Physical Fitness	-16.643 [b]	.000

Wilcoxon test results Signed Rank The test showed that the treatment had a significant effect on the variables BMI, knowledge, and physical fitness.

1. BMI

Based on the test results conducted on the BMI variable, a Z value of -3.048 was obtained. This Z value indicates how much the average difference between two data sets (for example, before and after the intervention) is from the mean of zero in a normal distribution unit. In this use, a negative Z value indicates a decrease in BMI after the intervention is applied. This means that after receiving the intervention, participants tend to have a lower BMI compared to before the intervention. Furthermore, the significance value obtained from this analysis is 0.002. In statistical research, this significance value is often compared to the commonly used significance level, which is 0.05 or 5%. If the p-value (significance value) is less than 0.05, then the results are considered statistically significant. Thus, these results indicate that the decrease in BMI after the intervention is statistically significant especially for obese group.

2. Nutritional knowledge

Based on the test results conducted on nutritional knowledge, the Z value obtained for the knowledge variable is -14.663. This number reflects a very significant change in the data; a negative Z value indicates that after the intervention, the participants' knowledge scores increased compared to before the intervention. The greater the absolute value of Z, the greater the difference between the two sets of data being compared. In this case, a high and negative Z value confirms that the intervention has succeeded in substantially increasing participants' knowledge. The significance value obtained from this result is 0.000. When the p-value is 0.000, this indicates that there is very strong evidence to reject the null hypothesis; in other words, the results obtained are very unlikely to occur by chance. In this use, a significance value of 0.000 is far below the general threshold of 0.05, which means that the change in participants' knowledge after the intervention is very statistically significant.

3. Physical fitness

Based on the results of the test conducted on the physical fitness variable, a Z value of -16.643 was obtained. This Z value shows how much the average difference between two data sets (for example, before and after the intervention) is from the mean of zero in normal distribution units. In this use, a negative Z value indicates a significant increase in student physical fitness after the intervention is applied. This means that after receiving the intervention, participants tend to have better physical fitness compared to before the intervention. Furthermore, the significance value obtained from this analysis is 0.000. In statistical research, this significance value is often compared to the general significance level, which is 0.05 or 5%. If the p-value (significance value) is less than 0.05, then the results are considered statistically significant. Thus, these results indicate that the increase in physical fitness after the intervention is statistically significant, which means that the intervention carried out has a real impact on increasing students' physical fitness.

Discussion

1. The Haheho Application on BMI (Body Mass Index)

Haheho application has been proven to have a significant effect on reducing the body mass index (BMI) of obese group participants after following a training program through this application. In the digital era like today, technology plays an increasingly important role in personal health monitoring, and Haheho is one of the innovations that has succeeded in utilizing this development. With a combination of tracking physical activity features, nutritional knowledge, and community support, this application offers a comprehensive approach to help users achieve their health goals.

These results align with several previous studies that have shown that digital application-based interventions effectively reduce BMI and improve overall health. research conducted by Granado-Font and colleagues (2015) Found that the use of health applications that provide guidance and monitoring of physical exercise significantly increases physical activity and helps in weight loss. In the study, digital applications were shown to be able to motivate users to participate in fitness programs, improve exercise patterns, and ultimately reduce BMI.

Another study by Carter and colleagues (2013) It also supports these findings, where technology-based interventions, including the use of apps, were effective in helping participants manage their weight through regular exercise and nutrition monitoring. Apps that combine training features and real-time BMI measurement provide users with the opportunity to manage their progress, which in turn improves fitness outcomes.

In the use of the Haheho application, the intervention provided through structured interval training for 18 sessions had a significant impact on reducing participants' BMI. The application provides key features such as user-tailored exercise guidance, progress monitoring, and BMI calculation, all of which play a role in helping participants achieve their fitness goals. These findings strengthen the conclusion that application-based interventions, including Haheho app, help reduce BMI and contribute to healthier lifestyle changes. The success of the Haheho application in this study adds to the evidence that digital technology can be an effective tool in facilitating fitness and health programs.

2. Haheho Application on Nutritional Knowledge

Haheho application has a significant impact on increasing participants' nutritional knowledge after the intervention. This application is equipped with nutritional education features integrated into the physical training program, such as a nutrition module that provides information about balanced food intake, calorie needs, and the importance of proper nutritional consumption for physical fitness. The quiz feature in the application also allows participants to evaluate their understanding of the nutritional material that has been presented, thus ensuring that the information is well absorbed. Key features of the app include a nutrition module that provides practical guidance on proper food intake, information on daily calorie requirements, and an explanation of the role of each food group in supporting physical fitness.

This feature directly supports previous research that confirms that structured nutrition education through application-based technology can improve participants' understanding of the relationship between diet and health. Research by Ulfa and colleagues (2022) Showed

that a mobile application equipped with interactive nutrition modules significantly increased awareness of the importance of nutritional balance among fitness program participants. Technology-based interventions, including mobile applications, are effective in improving nutrition knowledge and promoting healthy behavior change (Chueh et al., 2024). The Haheho application, with a similar approach, successfully leverages technology to provide relevant and informative nutrition education, thereby encouraging participants to pay more attention to students' diets.

In addition to the information module, this application also has an interactive quiz feature that functions as an evaluation tool for participants. This feature allows users to evaluate their understanding of the material that has been studied, as well as provide direct feedback on their level of understanding. This type of evaluation mechanism refers to research by Tandiono (2024), which found that interactive evaluation tools, such as quizzes, can increase information retention by up to 40% better than passive learning methods. Overall, the Haheho application not only acts as an educational tool but also as an evaluation platform that facilitates in-depth and sustainable improvement of nutritional knowledge.

3. Haheho Application on Physical Fitness

The Haheho app has become a significant tool in improving users' physical fitness, especially in this digital era. One of the main features of Haheho is its ability to offer personalized training programs, which have been shown to increase individuals' motivation and adherence to exercise routines, as explained in a study by Nowosielski and colleagues (2016). The app analyzes user data to recommend appropriate exercise types and intensities, allowing users to gradually increase their physical capacity. In addition, the progress tracking feature provided by Haheho allows users to see their progress in terms of time, distance, and intensity of exercise.

One of the key aspects of Haheho is the personalization of training programs. Research by Almutari and colleagues (2024) Shows that programs tailored to individual needs can increase motivation and engagement in physical activity. By analyzing user data, Haheho is able to recommend exercises that are appropriate to each individual's fitness level and goals. This approach not only helps users achieve their fitness goals but also reduces the risk of injury due to exercises that are not appropriate for the student's physical abilities.

In addition to personalization, the progress tracking feature provided by Haheho also contributes greatly to increasing physical fitness. Research by Bhawankar (2024) Confirms that real-time progress tracking can provide a deep sense of accomplishment, thus encouraging individuals to stay committed to their exercise routine. In this application, users can monitor various metrics such as exercise time, distance traveled, and activity intensity. By seeing real progress, users feel more motivated to continue exercising and overcome students' physical limitations.

Variety in training programs is essential to maintain user interest. Research by Swank (2013) Shows that variety in training can reduce boredom and increase compliance. Haheho offers a variety of training types, from cardio to strength and flexibility, which makes the training experience more interesting and enjoyable. Thus, users are not only focused on one type of training but can explore various activities that can improve overall physical fitness.

In conclusion, the Haheho app functions not only as a training tool but also as a holistic platform that combines personalization, progress tracking, social support, and program variations to improve user physical fitness. By leveraging the scientific research underlying each feature, Haheho is able to provide a significant positive impact on the user's physical abilities, making it an invaluable tool on the journey to better health and fitness. As technology advances and the understanding of fitness improves, apps like Haheho can continue to adapt and evolve to meet the needs of future users.

Conclusion

The program to increase the physical fitness and nutrition knowledge of school community with the Haheho Apps application can increase motivation for undergoing exercise programs and learning balanced nutrition material; This application can also provide more experience for school community in getting to know various variations of movement and intensity of exercise. Through the use of the Haheho apps, fitness training becomes more attractive, increasing motivation to carry out exercise programs. Through the use of this application, the learning material taught becomes clear and meaningful. So it can improve physical fitness and enrich the movement experience. This is proven by the results obtained after being given treatment; there was an increase in physical fitness.

The initial abilities measurement (pre test) showed that the physical fitness level was 37% with the category of very poor, 24% in the poor category, 27 in the sufficient category, 11% in the good category, and 5% in the very good category, meanwhile, for nutrition knowledge, the average score was 60. After carrying out treatment via the Haheho Apps application and carrying out a final ability test (post test), the physical fitness level was obtained at 2% with the category very poor, 7% in the poor category, 60% in the sufficient category, 22% in the good category and 9% in the aspect Nutritional knowledge has increased, as proven by the average score of 85. So it can be concluded that using is a significant influence of using Haheho Apps on improving students ' physical fitness and nutrition knowledge.

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