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Changes in Physical Activity Among Nursing Students Following Use of the Strava Application: A One-Group Pretest–Posttest Study

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ABSTRACT

Low physical activity among nursing students is a health concern because they are expected to become future health promoters and role models for healthy behavior. Digital health promotion through fitness tracking applications may support students in monitoring and improving their physical activity. This study aimed to examine changes in nursing students' physical activity after using the Strava application as a digital health promotion medium. This study used a quantitative pre-experimental design with a one-group pretest-posttest approach. A total of 193 nursing students completed both pretest and posttest measurements. Physical activity was measured using the Indonesian version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Participants used the Strava application for two weeks to record and monitor their preferred physical activities. Data were analyzed using the Shapiro-Wilk normality test and the Wilcoxon signed-rank test. Before using Strava, most respondents had low physical activity, with 109 students (56.5%) in the low category, 78 students (40.4%) in the moderate category, and 6 students (3.1%) in the high category. After using Strava, the low category decreased to 70 students (36.3%), while the moderate category increased to 109 students (56.5%) and the high category increased to 14 students (7.3%). The median MET-minutes/week increased from 509.00 (IQR = 736.00; Q1-Q3 = 228.50-964.50) at pretest to 842.00 (IQR = 1139.50; Q1-Q3 = 500.50-1640.00) at posttest. The Wilcoxon signed-rank test showed a significant difference between paired pretest and posttest MET scores ($Z = -8.176$; $p < 0.001$; $r = 0.59$). These findings suggest that Strava may support improvements in physical activity among nursing students. However, because this study used a one-group pretest-posttest design without a control group, the findings should be interpreted as an observed association rather than definitive causal evidence.

Keywords: Strava, physical activity, nursing students, digital health promotion, mobile health

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INTRODUCTION

Physical activity is an essential component of health promotion because it contributes to the prevention of non-communicable diseases and the improvement of physical and psychological well-being (WHO, 2020; Garcia et al., 2023). The World Health Organization recommends that adults aged 18-64 years perform at least 150-300 minutes of moderate-intensity aerobic physical

activity or 75-150 minutes of vigorous-intensity aerobic physical activity per week. However, physical inactivity remains a global health problem. In Indonesia, insufficient physical activity is still a concern among young people and students because academic activities, screen time, and sedentary behavior may reduce opportunities to be physically active (SKI, 2023; Strain et al., 2024).

Nursing students are a population that requires special attention because they are future health professionals who are expected to become role models in practicing healthy lifestyles. Ideally, nursing students should not only understand health promotion concepts theoretically but also apply them in daily life, including maintaining regular physical activity. Nevertheless, academic workload, clinical practice demands, long study hours, screen time, fatigue, and limited free time may reduce their motivation and opportunity to engage in physical activity (Maryana & Susanto, 2022; Koa, 2024). This condition can affect their self-care behavior and may weaken their role as future health promoters (Damayanti et al., 2025).

In the context of nursing, physical activity is closely related to self-care. Based on Orem's Self-Care Deficit Nursing Theory, individuals need to maintain a balance between activity and rest as part of universal self-care requisites. When nursing students are unable to maintain regular physical activity due to academic and environmental barriers, a self-care deficit may occur (Potter et al., 2022). Therefore, an adaptive and practical intervention is needed to help students monitor, maintain, and improve their physical activity independently.

The development of digital technology provides new opportunities for health promotion, especially among students who are familiar with smartphones and mobile applications (WHO, 2021; APJII, 2023). Digital health promotion can support behavioral change through self-monitoring, feedback, goal setting, social support, and motivation. One application that has the potential to support physical activity is Strava. Strava allows users to record activities such as walking, running, and cycling, monitor progress, set targets, and interact with other users through features such as clubs, challenges, leaderboards, comments, and kudos (Strava, n.d.-a; Strava, n.d.-b). These features may encourage users to become more aware of their activity patterns and more consistent in performing physical activity.

Although digital health applications have been widely studied in relation to physical activity, research specifically examining Strava as a health promotion medium among nursing students in Indonesia remains limited (Franken et al., 2023; Peng et al., 2023). Most previous studies have focused on general digital health interventions, conventional education, or structured exercise programs. Therefore, it is important to examine whether Strava can be used as an accessible and flexible digital health promotion medium to support physical activity among nursing students.

Based on this background, the research problem in this study is how nursing students' physical activity changed after using the Strava application. This study aimed to examine changes in physical activity after the use of the Strava application as a digital health promotion medium among nursing students. Specifically, this study aimed to identify the level of physical activity before using Strava, identify the level of physical activity after using Strava, and analyze the difference in paired MET-minutes/week scores before and after Strava use (Bi et al., 2024; Dewi et al., 2022). Because this study used a one-group pretest-posttest design, causal claims were interpreted cautiously.

METHODS

This study used a quantitative pre-experimental design with a one-group pretest-posttest approach. This design was applied to examine changes in physical activity before and after the use of the Strava application as a digital health promotion medium among nursing students. The study was conducted at the Bachelor of Nursing Program, STIKes Budi Luhur Cimahi. Because the design did not include a control group, the study cannot fully eliminate alternative explanations

such as increased awareness after the pretest, social desirability bias, peer influence, academic schedule changes, or external physical activities during the two-week period.

The sample consisted of 193 third-year nursing students who met the inclusion and exclusion criteria and completed all stages of the study. The sampling technique used was non-probability sampling with a total sampling approach. The inclusion criteria included active nursing students aged 18-25 years, owning a smartphone, being able to access and operate the Strava application, and being willing to participate in the entire research process. Students who withdrew, had incomplete data, experienced technical problems, had injuries or acute illness limiting physical activity, or had previously used Strava were excluded.

The research instrument used was the International Physical Activity Questionnaire-Short Form (IPAQ-SF) Indonesian version to measure physical activity in the last seven days. Physical activity scores were calculated in MET-minutes/week and categorized into low, moderate, and high activity levels. The IPAQ-SF score was calculated using the following formula: walking MET-minutes/week = 3.3 x walking minutes x walking days; moderate activity MET-minutes/week = 4.0 x moderate activity minutes x moderate activity days; vigorous activity MET-minutes/week = 8.0 x vigorous activity minutes x vigorous activity days. Total MET-minutes/week was obtained by summing walking, moderate, and vigorous activity scores. Low physical activity was defined as not meeting the criteria for moderate or high activity. Moderate physical activity was defined as meeting at least one of the following criteria: three or more days of vigorous activity for at least 20 minutes per day, five or more days of moderate activity or walking for at least 30 minutes per day, or five or more days of any combination of walking, moderate, or vigorous activity achieving at least 600 MET-minutes/week. High physical activity was defined as vigorous activity on at least three days achieving at least 1,500 MET-minutes/week, or seven or more days of any combination of walking, moderate, or vigorous activity achieving at least 3,000 MET-minutes/week (International Physical Activity Questionnaire Research Committee, 2005). The Indonesian version of IPAQ has been reported to have acceptable validity and reliability for assessing physical activity (Dharmansyah & Budiana, 2021).

The intervention was carried out for two weeks. Before the intervention, respondents received technical training and introduction regarding the use of the latest version of the Strava application, including account use, GPS activation, activity recording, saving activity logs, and viewing activity history. Respondents were asked to use Strava to record physical activity, but the type of activity was left free according to each respondent's preference, ability, and daily schedule. No specific target was imposed by the researchers, such as minimum steps, distance, duration, or frequency. Respondents were invited to join a Strava Club, although not all respondents joined the club. Strava features such as activity logs, route records, duration, distance, pace, comments, kudos, and other social features were used by some respondents; therefore, these features functioned as supportive motivational features rather than mandatory intervention components for all participants. Adherence was monitored through a WhatsApp group and support or reminders from close peers or people around the respondents. Researchers also checked Strava activity logs through screenshots submitted by respondents. Physical activity was measured before the intervention through pretest and after the intervention through posttest using the same IPAQ-SF scoring procedure.

Data were processed through editing, coding, scoring, data entry, cleaning, and tabulating. Univariate analysis was used to describe respondent characteristics and physical activity levels before and after the intervention. Data normality was tested using the Shapiro-Wilk test. Since the data were not normally distributed, bivariate analysis was performed using the Wilcoxon signed-rank test on paired MET-minutes/week scores with a significance level of 0.05. The Wilcoxon effect size was calculated using $r = |Z| / \sqrt{N}$. This study applied research ethical principles, including autonomy, confidentiality, beneficence, and justice. Respondents received information about the objectives, procedures, benefits, and possible risks of the study before

signing informed consent. Respondent identities were kept confidential, and all data were used only for research purposes. Ethical approval was obtained from Komite Etik Penelitian (KEPPIN), approval number 002200/STIKes Budi Luhur Cimahi/2026, on 23 April 2026. Informed consent was obtained from all participants before data collection.

RESULTS

A total of 193 respondents completed both pretest and posttest measurements and were included in the final analysis. The characteristics of respondents based on age showed that most respondents were 21 years old, with 111 students (57.5%). This indicates that the majority of respondents were in the early adulthood age group.

Table 1. Frequency Distribution of Respondents by Age

Age	Frequency (f)	Percent (%)
19	2	1.0
20	47	24.4
21	111	57.5
22	33	17.1
Total	193	100.0

The characteristics of respondents based on gender showed that most respondents were female, with 159 students (82.4%), while male respondents accounted for 34 students (17.6%).

Table 2. Frequency Distribution of Respondents by Gender

Gender	Frequency (f)	Percent (%)
Male	34	17.6
Female	159	82.4
Total	193	100.0

The distribution of physical activity levels showed an improvement after using the Strava application. Before the intervention, most respondents were in the low physical activity category, with 109 students (56.5%). After using Strava, the low category decreased to 70 students (36.3%), while most respondents shifted to the moderate physical activity category, with 109 students (56.5%). The high physical activity category also increased from 6 students (3.1%) to 14 students (7.3%). This pattern indicates a shift from low physical activity toward moderate and high physical activity after the two-week intervention.

Table 3. Distribution of Physical Activity Levels Before and After Using Strava

Physical Activity Level	Pretest		Posttest	
	Frequency (f)	Percent (%)	Frequency (%)	Percent (%)
Low	109	56.5	70	36.3
Moderate	78	40.4	109	56.5
High	6	3.1	14	7.3
Total	193	100.0	193	100.0

The normality test using the Shapiro-Wilk test showed that both pretest and posttest MET-minutes/week scores had a significance value of <0.001. Since the p-value was less than 0.05, the data were not normally distributed. The median MET-minutes/week increased from 509.00 at pretest to 842.00 at posttest, showing a median increase of 333.00 MET-minutes/week. The pretest interquartile range (IQR) was 736.00 with Q1-Q3 values of 228.50-964.50, while the posttest IQR was 1139.50 with Q1-Q3 values of 500.50-1640.00.

Table 4. Median and Interquartile Range of MET-minutes/week

Time Point	Median	Q1-Q3	IQR
Pretest	509.00	228.50-964.50	736.00
Posttest	842.00	500.50-1640.00	1139.50

Note. IQR = interquartile range; Q1 = 25th percentile; Q3 = 75th percentile.

Table 5. Shapiro-Wilk Normality Test Results

Time Point	Shapiro-Wilk		
	W	**df**	**Sig.**
MET Pretest	0.703	193	< 0.001
MET Posttest	0.816	193	< 0.001

The Wilcoxon signed-rank test showed a significant difference in paired MET-minutes/week scores before and after using the Strava application, with a Z value of -8.176 and a p-value of <0.001. The rank distribution showed 34 negative ranks, 157 positive ranks, and 2 ties. The calculated effect size was r = 0.59, indicating a large effect. This result indicates that Strava use was associated with a significant increase in physical activity among nursing students.

Table 6. Wilcoxon Signed-Rank Test Results of Physical Activity Before and After Using Strava

Comparison	Rank Category	*N*	Mean rank	Sum of rank	*Z*	*p*	*r*
Posttest-Pretest	Negative rank	34	85.68	2913.50	-8.176	< 0.001	0.59
	Positive rank	157	98.23	15422.50			
	Ties	2					
	Total	193					

DISCUSSION

The results of this study showed that Strava use was associated with a significant increase in physical activity among nursing students. Before the intervention, most respondents were classified in the low physical activity category, whereas after two weeks of using Strava, the majority shifted to the moderate activity category. The decrease in the low category from 56.5% to 36.3% and the increase in the moderate category from 40.4% to 56.5% indicate a meaningful behavioral shift at the group level. However, because this study used a one-group pretest-posttest design without a control group, the findings should be interpreted cautiously as an observed improvement associated with Strava use, not as definitive proof of causality.

The improvement in physical activity may be explained by Strava's self-monitoring function. Respondents were able to record their activities, view duration and distance, and monitor their activity history. Self-monitoring can increase awareness of daily behavior and may encourage individuals to become more active. The two-week increase may also have occurred because the pretest, training, and monitoring process made students more aware that their physical activity was being observed, which may have increased motivation during the study period.

Social reinforcement may also have contributed to the observed improvement. Some respondents joined the Strava Club and some used social features such as comments and kudos. Although these features were not used by all participants, peer visibility, WhatsApp group monitoring, and support from people around the respondents may have created accountability and encouragement. This mechanism is consistent with evidence that social networking features in physical activity applications can influence user engagement (Franken et al., 2023).

From a theoretical perspective, the findings are consistent with behavior change frameworks such as COM-B and Self-Determination Theory. Strava may support capability by helping students understand and monitor their physical activity, opportunity by providing a flexible tool that can be used in daily routines, and motivation through feedback, progress records, and peer support. These mechanisms are also related to autonomy, competence, and relatedness, which are important psychological needs for maintaining health behavior.

Compared with traditional health promotion methods, Strava offers flexibility and accessibility. Nursing students can record walking, running, cycling, or other preferred activities without attending a structured exercise program. This may be suitable for students with academic workload and clinical obligations. Previous systematic reviews have also suggested that digital health interventions can improve physical activity among college students, although intervention effects vary depending on duration, features, engagement, and study design (Bi et al., 2024; Peng et al., 2023).

Nevertheless, the clinical meaningfulness of the increase should be interpreted carefully. The median MET-minutes/week increased from 509.00 (IQR = 736.00) to 842.00 (IQR = 1139.50), and the proportion of students in the moderate category increased. This suggests a positive movement toward recommended activity levels. However, a considerable proportion of respondents still remained in the low activity category after the intervention. This may be due to academic demands, fatigue, limited time, lack of motivation, technical barriers, or inconsistent use of Strava features during the two-week period.

This study has several limitations. First, the absence of a control group limits causal inference. Improvements may have been influenced by increased awareness after the pretest, Hawthorne effect, social desirability bias, peer influence, academic schedule changes, or external physical activities outside the intervention. Second, the intervention period was relatively short, so the sustainability of the observed improvement cannot be determined.

Another limitation is the use of self-reported IPAQ-SF data. Although IPAQ-SF is widely used and practical for population studies, it depends on respondents' memory and honesty. Recall bias and over-reporting may occur, especially when participants know that physical activity is being evaluated. Future studies should combine IPAQ-SF with objective application-based data or wearable device data to improve measurement accuracy.

The single-institution sample may also affect generalizability. Results may differ in other nursing schools or regions with different demographic, cultural, technological, and academic characteristics. Future studies should involve multiple institutions, longer intervention periods, and control groups to strengthen internal and external validity.

Overall, this study suggests that Strava may serve as a promising digital health promotion medium for supporting physical activity among nursing students. The combination of self-monitoring, flexible activity choice, peer support, and application-based feedback can be integrated into student wellness programs. However, further controlled and long-term studies are needed before stronger conclusions about effectiveness and sustained behavioral change can be made.

CONCLUSION

The findings of this study indicate that Strava use was associated with a significant increase in physical activity among nursing students. Before the intervention, most respondents were classified in the low physical activity category, while after using Strava for two weeks, the majority achieved moderate physical activity levels. The Wilcoxon signed-rank test confirmed a significant improvement in paired MET-minutes/week scores ($Z = -8.176$; $p < 0.001$; $r = 0.59$).

The observed improvement may be related to the self-monitoring features of Strava, activity recording, feedback, peer support, and partial use of social features such as Strava Club,

comments, and kudos. These features may help students become more aware of their activity patterns and support motivation to be more physically active within their daily routines.

Because this study used a pre-experimental one-group pretest-posttest design without a control group, the results should not be interpreted as definitive causal evidence. The improvement may also have been influenced by pretest awareness, Hawthorne effect, social desirability bias, peer influence, academic schedule changes, or external activities. Future studies are recommended to use controlled designs, longer follow-up periods, and objective activity measurements to confirm the long-term impact of Strava-based digital health promotion.

RECOMMENDATION

Based on the findings of this study, it is recommended that nursing students use digital activity tracking applications such as Strava to monitor and support their physical activity. Regular use of activity recording, progress monitoring, and feedback features may help students become more aware of their daily activity patterns despite academic workload and other constraints.

Higher education institutions, especially nursing programs, are encouraged to integrate digital health promotion tools such as Strava into student wellness programs. Activities such as voluntary activity groups, campus walking or running challenges, inter-class participation, and peer support through online groups may increase engagement and motivation among students.

For health professionals and educators, it is suggested to provide guidance on using mobile applications effectively for health promotion. Future interventions may combine application-based monitoring with periodic feedback, educational sessions, and objective activity measurements. Future research should use control groups, longer intervention periods, and multi-site samples to provide stronger evidence regarding the effectiveness of digital health interventions on students' physical activity.

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