European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 10, 2020

# Effectiveness of Smartphone Apps and Team Supports by Social Media Approaches to Promote Physical Activity Levels among Indonesian Nursing Students: Feasibility Study

Running tittle: Smartphone-Apps and Team Supports to Promote Physical Activity Levels among Indonesian Nursing-Students

Suardi Suardi [1], Ernawati Ernawati [2], Ferdy Lainsamputy[3], Sumarmi Sumarmi[4], Fransiskus Xaverius Widiantoro[5]

[1]*S.Kep, Ns., M.Kep, Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Tanawali Takalar, South Sulawesi, Indonesia.*

[2]*S.Kep, Ns., M.Kep, Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Tanawali Takalar, South Sulawesi, Indonesia.*

[3]*MS., RN, Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Husada Mandiri Poso, Central Sulawesi, Indonesia, Indonesia*

[4]*MS., RN, Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Tanawali Takalar, South Sulawesi, Indonesia.*

[5]*MS., RN, Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Santo Borromeus, Padalarang, West Java, Indonesia*

*e-mail: fwidhie@gmail.com*

***ABSTRACT***

***Background***

***Little known effectiveness of smartphone app exercise user in Indonesian nursing-students. It is necessary to explore the influence of interactive technologies on self-rated health or overall well-being. This study was evaluated an interactive smartphone-health app for nursing-students and the impact of a program building with psychosocial base on the increase of exercise efficacy to promote levels of physical activity (PA).***

***Methods***

***A pretest-posttest non-equivalent control design applied in 70 Indonesian nursing-students. A randomized assignment with a time-cluster technique used to avoid information contamination between groups. The web-based group received a social cognitive theory-based behavioral skill-building intervention by a web-based game with team competition for 10-week of a program. Outcome included level of PA, health outcomes, and self-efficacy. Multivariate ANCOVA and Chi-square test were adopted to test pre- and post-outcome effects.***

***Results***

***The main effects of the intervention on the number of steps/day, distance walked, calories consumption, duration, and systolic blood pressure were significant ($p<0.05$). The intervention group participants recorded more steps/day ($p < 0.001$, eta = 0.522), greater distances walked ($p < 0.001$, eta = 0.521), greater calories consumption ($p < 0.001$, eta = 0.419), longer durations ($p < 0.001$, eta = 0.217), lower systolic blood pressure ($p < 0.05$, eta = 0.103), and self-efficacy ($p > 0.05$, eta = 0.041) than the control group participants.***

***Conclusion***

***Web-based game combined with group competition programs could successfully increase PA among nursing-students.***

***Keywords: web-based, physical activity, self-efficacy, social cognitive theory, university students***

## 1. INTRODUCTION

The transition from adolescence to young adulthood is considered as a critical period for lowered physical activity (PA) among university students [1]. During this transition, some stressors such as health motives, peer pressure, course work management, and difficult schedules become main reasons for physical inactivity [2]. Insufficient PA has a 20% to 30% leading risk factors of death compare active people [3]. People who perform insufficient PA has 11% higher risk of mortality from non-communicable diseases than those meet the physical activity guidelines [4]. According to a worldwide survey of the prevalence of physical inactivity among university students across 23 countries, the overall prevalence rate of low-intensity physical activity (PA) was 41.4% [5]. Another works have well-documented that physical inactivity prevalence and participation rates tended to be low among university students [6,7].

Indonesia is ranked 31$^{th}$ out of 46 countries in activity inequality [8]. In general, policies play a significant role in individuals' physical education literacy and attitudes. Per the educational policy in Indonesia, physical education is not mandatory after high school. It is regulated by the Indonesia Constitution in Peraturan Pemerintah (PP) No. 19 Tahun 2005 and Peraturan Menteri Pendidikan Nasional (Permendiknas) No. 22 Tahun 2006. Sports and health education is just left to the students' preferences. Considering the above situation, incorporating PA into university students' lifestyle is a key strategy to enhance their PA level.

It is necessary and essential to promote university students' physical activity behaviors and to support long-lasting behavior changes beyond late adulthood [9]. However, the determinants and antecedents of PA are diverse; thus, increasing PA is a societal rather than an individual problem for school-based populations [10].

The health behavior change theory with demonstrated success improving health behaviors is the social cognitive theory (SCT). Briefly, the SCT is predicated upon reciprocal determination between (a) individual characteristics, (b) environmental factor, and (c) behavior [11]. For instance, an individual with low PA self-efficacy (i.e., situational self-confidence) and within an unsupportive environment for PA is less likely to engage in PA behavior. Health behavior change interventions built upon the SCT have improved college students' PA behaviors [12,13].

The environmental support needs to be considered in designing a feasible intervention for

promoting university students' physical activity. Besides, the strategies applied should be based on university students' preferences, and it is even better to incorporate such strategies in their daily activities, such as electronic technology usages via the Internet and smartphones [14].
Indonesia is recognized as the country with the third highest number of Internet users in the world, with more than half of Indonesian people using smartphones and the Internet actively and over 30% of them being students [15]. However, little is known about the effectiveness of smartphone app exercise use among nursing students. Therefore, it is necessary to explore the influence of digital physical activity promotion and interactive technologies on self-rated health or overall well-being. This study conducted a PA intervention through a developed interactive smartphone exercise-based game (ISEB) and social media for Indonesian nursing students to determine the role of the Internet-delivered program as a media in increasing PA.

## 2. MATERIALS AND METHODS

**Study design**

The research was conducted under the nonequivalent control group design. Recent study was a 10-week 1:1 time-cluster randomization of an intervention group versus a control group among nursing students. A time-cluster randomized design was used to minimize between-groups contamination by using two groups (intervention and comparison) from a university for related information.

**Setting and sample**

Seventy university nursing students in Makassar, Indonesia who were aged 20 years or above, willing to participate, in possession of smartphones with Internet access, and abstain from other PA or fitness training programs during the current study's period were allowed to register for ISEB. This study was conducted from February to September 2020. Data from 70 students (intervention group, n = 34; control group, n = 36) who responded to all our scheduled inquiries during the intervention were analyzed. All participants were assessed at 2-time points: at entry as the baseline and after 10 weeks of intervention.

**Ethical consideration**

The Ethics Committee of the Ethics Review Board of the Local Government (Ref: 423.4/0012/wasbang/2020) approved the present study. All participants were provided a consent form and given the assurance of data confidentiality and privacy.

**Measurements/Instruments**

Physical activity levels were measured by a small tri-axial accelerometer to be worn about the dominant wrist as a watch. Movement data including data on daily steps, distance walked, duration, and energy consumption for PA were transmitted to the smartphone app.
Physical anthropometrics including height and weight were measured by a valid electronic stadiometer. Blood pressure was measured by a registered nurse using a validated and calibrated digital automated sphygmomanometer after the participants had rested for at least 15 minutes [16]. Two consecutive measurements were obtained 5 minutes apart, and the average of the two readings was recorded [17].
Self-efficacy for PA will be measured using a 9-item scale developed by Resnick and Jenkins [18]. Resnick and Jenkins demonstrated acceptable internal consistency ($\alpha$ = 0.92), and a squared multiple correlation coefficient using structural equation modeling of reliability ($r^2$

ranged from 0.38 to 0.76).

**Data collection/Procedure**

An interactive smartphone exercise-based game (ISEB) was used to promote the PA levels of the nursing students in the intervention group. The PA levels of both groups were showed by the daily use of ISEB on the smartphone. Using those data they play the social game.

First, the researchers explained the purpose of this study and provided PA-related knowledge through a booklet. A 30-minute self-administrated structured questionnaire was used to collect data, including those on social demographics, self-efficacy (SE) in exercise of PA. Besides, height, weight, and blood pressure were assessed, while the levels of PA were measured by smartphone health monitor app for 7 days.

After the pretest, the intervention group received an addition of a guided 50 minutes' instruction to learn to use the smartphone health monitor app to collect PA information and ISEB program for the 10 weeks of social media competition game implementation. Regarding ethics issues, ID and password were set by each user through the smartphone app to review individual PA information. For the social media competition game, 11 teams of 3 to 4 members were created in the intervention group based on friendship. Participants in the control group received usual care.

**Data analysis**

Demographic characteristics and baseline measures were compared at baseline using Pearson's chi-square test and independent samples t-test. Changes from pretest to posttest in outcome variables were calculated. Four multivariate ANCOVAs, with the baseline scores serving as covariates, were used to measure differences in self-efficacy between the groups after 10 weeks. All the statistical analyses were carried out using SPSS version 17 (IBM, Chicago, Illinois). All the tests were conducted at $\alpha$ of 0.05. If the $\rho$-value $\leq 0.05$, the analyzed data were considered statistically significant.

## 3. RESULTS

***Demographics***

The participants' ages ranged from 22 to 25 years, 23.16 years being the average. Twenty-one percent of them were received diploma program. The average weight and BMI of participants in each group were 62.35 kg and 24.54 kg/m2, respectively. The majority of the participants had no smoking history (n = 61, 87.5%), no hypertension history (n = 56, 80.0%), and no family history (n = 67, 96.1%). There were no significant differences between the intervention and control groups in any of the demographic, physical activity, and self-efficacy (SE) variables at pretest (all $p > 0.05$, see Table 1). On average, 90%–95% of the participants accessed the smartphone App and recorded PA, and 85% had increased PA. The attrition rate was about 21% for the intervention group and 18% for the control group.

***At the End of the Intervention***

A series of 2 (intervention or control) between-groups ANOVA tests showed no significant pretest effect on the number of steps/day, distance walked, calories consumption, duration, body weight, BMI, systolic blood pressure, and SE (all $p > 0.05$). Therefore, pretest sensitization did not occur for any of the outcome measures (Tables 1–2).

The main effects of the intervention on the number of steps/day, distance walked, calories consumption, duration, and systolic blood pressure were significant. The intervention group participants recorded more steps/day ($p < 0.001$, eta = 0.522), greater distances walked ($p < 0.001$, eta = 0.521), greater calories consumption ($p < 0.001$, eta = 0.419), longer durations ($p < 0.001$, eta = 0.217), and lower systolic blood pressure ($p < 0.05$, eta = 0.103) than the control group participants. No main effects of the intervention were observed on body weight ($p > 0.05$, eta = 0.031) and BMI ($p > 0.05$, eta = 0.049). The main effects of the intervention were observed on self-efficacy ($p > 0.05$, eta = 0.041).

## 4. DISCUSSION

This is the first reported study, which used smartphone health monitor app in combination with social media group competition as a tool to promote PA in Indonesia. Overall, the intervention was successful with medium effects. The intervention had significant effects on the number of steps/day, distance walked, calories consumption, and duration of physical activity. However, this association is stronger for higher-intensity physical activity. Participants in the current study could participate in the PA of their own choosing and were asked to increase duration of PA by 30 minutes per week. Although the participants met our recommendations, it was likely that the PA conducted might not have been of sufficient intensity to improve the cardiovascular fitness. However, the increase in PA might still have influenced health outcomes, particularly in the area of metabolic fitness, an area for future research.

Further work is required to determine how to maintain PA behavior in the longer term. Fjeldsoe and colleagues' [19] review of PA behavior change maintenance suggests that increasing the intervention's duration and/or building long-term follow-up prompts into the app may be useful in achieving this. While the study's intervention was mainly guided by the social cognitive theory (SCT), other behavior change theories, which emphasize behavior maintenance, such as the transtheoretical model [20]or the health action process approach, and self-regulation theories [21], may provide valuable insights into further strategies to maintain behavior changes in the longer term.

The success of the intervention in changing behavior and SCT variables is as reported by some previous studies on university students [12, 22-24]. An SCT-based Internet intervention was found to be a useful tool in the PA promotion of Indonesian nursing students. This study found that the number of steps/day of the participants in the control group remained at the low-end of step recommendation (i.e., < 7500) [25].

However, the participants in this study were neither contacted nor given any access to interactive features after the intervention period. Marcus et al. [26] suggest that the lack of contact with participants during follow-up might play a role in physical activity relapse. Physical activity relapse in previous studies might have occurred because most the existing web-based programs were not interactive enough during the intervention period to engage the participants fully [27,28]. Future studies should examine the influence of continued post-intervention contact or website access on the maintenance of PA.

This research highlights possible cross-cultural considerations for using SCT and the Internet to promote PA. The influence of the Indonesian culture might partially explain PA maintenance during intervention period. Cultural background and experiences can influence one's self; people's way of living, thinking, and behaving is influenced by culture [29,30]. People in Western countries are more likely to be independent (behavior is organized primarily by reference to one's own thoughts, feelings, and actions), whereas people in Asian countries are more likely to be interdependent (behavior is determined by the perceived thoughts, feelings, and actions of others) [29]. The interdependency of Indonesian nursing students may have a role in PA promotion, as corroborated by the low attrition rate of ~21% in this study in comparison to previous Western studies (~30%) by Vandelanotte et al. [31] and [23]. It was also possible that the relationship between the self and SCT variables in Indonesian nursing students was stronger than in Western students.

According to Bandura, SCT operates at interpersonal levels. SCT assumes that humans are social beings who develop their sense of self and personal efficacy from others through interpersonal exchanges, and that the interpersonal environment is critical in affecting and predicting one's health behavior and, in turn, health outcomes. Therefore, the interdependency in Indonesian nursing students may have a stronger influence on SCT variables than in Western students who may be more independent. However, the influence of culture on starting and maintaining PA was not examined in this study; thus, this suggestion needs verification, and future studies should examine the specific influence of culture on the efficacy of SCT-based PA programs.

Gamification has been a popular tech trend in recent years. A smartphone health monitor and social competition was carefully designed to incorporate numerous gamification features; however, usage statistics and participant feedback specific to these features suggested they were not strongly embraced by participants. Despite this, the smartphone health monitor and social competition overall achieved strong usage and participant feedback. It was possible that the influence of gamification was larger than the participants indicated—that it worked in a subconscious way and did, in fact, contribute to engagement and utility of the smartphone health monitor and social competition.

Alternatively, it might be that gamification has been overhyped, or at least unsuccessful in the form in which it was implemented in our smartphone health monitor and social competition program. Such hypotheses cannot be answered by our study; indeed, the field of gamification for health behavior change is in its infancy, and considerable further work is needed to explore its efficacy and optimal application.

This study has some significant methodological and theoretical strength including the use of a randomized assignment with time-cluster randomized design as well as SCT and intervention mapping in developing the interactive intervention program. However, the research was limited to Indonesian university students who might be more likely to have access to the Internet compared to other Indonesia populations. Thus, the results are not generalizable to other Indonesia population groups. Future studies should confirm these findings with other Indonesian population groups and include a measurement of the intensity of the activity undertaken.

## 5. CONCLUSION

SCT and smartphone health monitor combine with social competition intervention can be used as a framework for developing physical activity interventions. An SCT-based Internet intervention program successfully promoted PA of Indonesian international university students, which is consistent with previous studies conducted in Western and Asian countries. The Internet is a potentially useful tool for delivering an SCT-based intervention PA program.

However, the intervention should be tested in a variety of population groups over a longer period before wide scale implementations.

**Acknowledgements**

The authors sincerely appreciate the Indonesian participants in the study to dedicate their data for the research team to develop a culturally adapted instrument.

**Declaration of interest statement**

No potential conflict of interest was reported by the authors

**Funding sources**

No external funding was received for this research

## 6. REFERENCES

[1] Corder K, Winpenny E, Love R, Brown HE, White M, Van Sluijs E. Change in physical activity from adolescence to early adulthood: A systematic review and meta-analysis of longitudinal cohort studies. *British journal of sports medicine*. 2019;53(8):496-503. doi:10.1136/bjsports-2016-097330

[2] Sukys S, Cesnaitiene VJ, Emeljanovas A, Mieziene B, Valantine I, Ossowski ZM. (2019). Reasons and barriers for university students' leisure-time physical activity: moderating effect of health education. *Perceptual and Motor Skills*. 2019;126(6):1084-1100. doi:10.1177%2F0031512519869089

[3] World Health Organization. Physical activity. Geneva. 2020. Available on https://www.who.int/news-room/fact-sheets/detail/physical-activity (assessed 28 November 2020).

[4] Zhao M, Veeranki SP, Magnussen CG, Xi B. Recommended physical activity and all cause and cause specific mortality in US adults: prospective cohort study. *Bmj*. 2020;370:1-10. doi:10.1136/bmj.m2031

[5] Pengpid S, Peltzer K, Kassean HK, Tsala JPT, Sychareun V, Müller-Riemenschneider F. Physical inactivity and associated factors among university students in 23 low-, middle- and high-income countries. *International journal of public health*. 2015;60(5):539-549.

[6] Rajappan R, Selvaganapathy K, Liew L. Physical activity level among university students: a cross-sectional survey. *International Journal of Physiotherapy and Research*. 2015;3(6):1336-1343. doi:10.16965/ijpr.2015.202

[7] Gastélum-Cuadras G, Lopes TC, de Oliveira ALB, Pernambuco CS, Brandão PP, Guimarães AC, ... Valentim-Silva JR. Physical Activity Epidemiology of University Students. *Research square*. 2020. doi:10.21203/rs.3.rs-39481/v1

[8] Althoff T, White RW, Horvitz E. (2016). Influence of Pokémon Go on physical activity: study and implications. *Journal of medical Internet research*. 2016;18(12):e315. doi:10.2196/jmir.6759

[9] Dumith SC, Hallal PC, Reis RS, Kohl III HW. Worldwide prevalence of physical inactivity and its association with human development index in 76 countries. *Preventive medicine*. 2011;53(1-2):24-28. doi:10.1016/j.ypmed.2011.02.017

[10] Alsubaie AS, Omer EO. Physical activity behavior predictors, reasons and barriers among male adolescents in Riyadh, Saudi Arabia: evidence for obesogenic environment. *International journal of health sciences*. 2015;9(4):400.

https://ijhs.org.sa/index.php/journal/article/view/1120
[11] Bandura A. Health promotion by social cognitive means. *Health education & behavior*. 2004;31(2):143-164. doi:10.1177%2F1090198104263660
[12] Mirzaei-Alavijeh M, Soroush A, Nasirzadeh M, Hatamzadeh N, Zinat-Motlagh F, Jalilian F, ... Mahboubi M. Socio-Cognitive Determinants of Regular Physical Activity among College Students. *World Family Medicine Journal: Incorporating the Middle East Journal of Family Medicine*. 2018;99(5832):1-5. doi:10.5742/MEWFM.2018.93256
[13] Sriramatr S, Silalertdeskul S, Wachirathanin P. Social cognitive theory associated with physical activity in undergraduate students: A cross-sectional study. *Pacific Rim International Journal of Nursing Research*. 2016;20(2):95-105. Available from https://he02.tci-thaijo.org/index.php/PRIJNR/article/view/41039
[14] Alfawareh HM, Jusoh S. Smartphones usage among university students: Najran University case. *International Journal of Academic Research*. 2014;6(2). doi:10.7813/2075-4124.2014/6-2/B.48
[15] Ministry of Communication and Information Technology. Annual reports 2017. Ministry of Communication and Information Technology; 2017 [cited 2020 August 10]. Available from https://web.kominfo.go.id/sites/default/files/KOMINFO_Laptah%202017_Final_English.pdf
[16] El Assaad MA, Topouchian JA, Darne BM, Asmar RG. Validation of the Omron HEM-907 device for blood pressure measurement. *American Journal of Hypertension*. 2002;15(S3):87A-87A. doi:10.1097/00126097-200208000-00006
[17] Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves J, Hill MN, ... Roccella EJ. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Hypertension*. 2005;45(1):142-161. doi:10.1161/01.hyp.0000150859.47929.8e
[18] Resnick B, Jenkins LS. Testing the reliability and validity of the self-efficacy for exercise scale. Nursing research. 2000;49(3):154-159. doi:10.1097/00006199-200005000-00007
[19] Fjeldsoe B, Neuhaus M, Winkler E, Eakin E. Systematic review of maintenance of behavior change following physical activity and dietary interventions. *Health Psychology*. 2011;30(1):99. doi:10.1037/a0021974
[20] Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *American journal of health promotion*. 1997;12(1):38-48. doi:10.4278%2F0890-1171-12.1.38
[21] Maes S, Karoly P. Self-regulation assessment and intervention in physical health and illness: A review. *Applied psychology*. 2005;54(2):267-299. doi:10.1111/j.1464-0597.2005.00210.x
[22] Wadsworth DD, Hallam JS. Effect of a web site intervention on physical activity of college females. *American Journal of Health Behavior*. 2010;34(1):60-69. doi:10.5993/ajhb.34.1.8

[23] Davies CA, Spence JC, Vandelanotte C, Caperchione CM, Mummery WK. (2012). Meta-analysis of internet-delivered interventions to increase physical activity levels. *International Journal of Behavioral Nutrition and Physical Activity*. 2012;9(1):52. doi:10.1186/1479-5868-9-52

[24] Kim SH, Kim MJ, Kim SH, Kim SY, Park CY, Bang JY. Effectiveness of Health Promotion Program Using Action Planning Strategy for Young Adults. *Journal of Korean Academy of Nursing*. 2019;49(4):461-471. doi:10.4040/jkan.2019.49.4.461

[25] Tudor-Locke C, Craig CL, Thyfault JP, Spence JC. A step-defined sedentary lifestyle index: <5000 steps/day. *Applied physiology, nutrition, and metabolism*. 2013;38(2):100-114. doi:10.1139/apnm-2012-0235

[26] Marcus BH, Forsyth LH, Stone EJ, Dubbert PM, McKenzie TL, Dunn AL, Blair SN. Physical activity behavior change: issues in adoption and maintenance. *Health psychology*. 2000;19(1S):32. doi:10.1037/0278-6133.19.suppl1.32

[27] Carr LJ, Bartee RT, Dorozynski C, Broomfield JF, Smith ML, Smith DT. Internet-delivered behavior change program increases physical activity and improves cardiometabolic disease risk factors in sedentary adults: results of a randomized controlled trial. *Preventive medicine*. 2008;46(5):431-438. doi:10.1016/j.ypmed.2007.12.005

[28] Linke SE, Dunsiger SI, Gans KM, Hartman SJ, Pekmezi D, Larsen BA, ... Marcus BH. Association between physical activity intervention website use and physical activity levels among Spanish-speaking Latinas: randomized controlled trial. *Journal of medical Internet research*. 2019;21(7):e13063. doi:10.2196/13063

[29] Markus HR, Kitayama S. Culture and the self: Implications for cognition, emotion, and motivation. *Psychological review*. 1991;98(2):224. https://psycnet.apa.org/doi/10.1037/0033-295X.98.2.224

[30] Lim KC, Waters CM, Froelicher ES, Kayser-Jones JS. Conceptualizing physical activity behavior of older Korean-Americans: An integration of Korean culture and social cognitive theory. *Nursing outlook*. 2008;56(6):322-329. doi:10.1016/j.outlook.2008.09.001

[31] Vandelanotte C, Spathonis KM, Eakin EG, Owen N. Website-delivered physical activity interventions: A review of the literature. *American journal of preventive medicine*. 2007;33(1):54-64. doi:10.1016/j.amepre.2007.02.041

Table 1. Demographic and behavior overall and by experimental condition (n=70)

| | Overall Mean (SD)/% | Intervention (n=34); M (SD)/% | Control (n=34); M (SD)/% | F or $X^2$ |
|---|---|---|---|---|
| Age | 23.16 (3.63) | 25.67(4.51) | 25.10(2.01) | 0.34 |
| Gender (male) | 57.1% | 59.7% | 56.9% | 0.23 |
| Education (bachelor degree) | 89.7% | 88.9% | 88.7% | 0.54 |
| Religion (Islam) | 59.3% | 60.0% | 62.4% | 0.45 |
| Smoking (never smoking) | 87.5% | 88.1% | 90.7% | 0.62 |

| | | | | |
|---|---|---|---|---|
| PA Habit (No) | 67.6% | 68.5% | 69.1% | 0.57 |
| DM History (No) | 96.1% | 94.1% | 96.4% | 0.80 |
| Hypertension History (No) | 80% | 81.3% | 83.2% | 0.71 |

1. SD = Standard deviasi; DM = Diabetes mellitus; PA = Physical activity

Table 2. Descriptive statistic for main study outcome pre and post test (n = 70)

| Variables | Mean (SD) | |
|---|---|---|
| | Pre test | Post test |
| **Physical activity** | | |
| Steps | 3475.25 (2623.81) | 6192.73(2751.12) |
| Distance | 2.47(1.67) | 5.12(2.13) |
| MET | 126.23(93.83) | 198.68(83.81) |
| Time | 34.25(22.78) | 65.25(43.23) |
| **Health outcomes** | | |
| Body weight | 62.35(11.14) | 61.89(11.38) |
| BMI | 24.54(3.12) | 24.00(3.10) |
| Systolic blood pressure | 121.39(11.61) | 119.39(10.45) |
| **Self-efficacy** | 80.34(29.92) | 84.12(32.24) |

2. MET=Metabolic equivalent of task; BMI= Body mass index

Table 3. Physical activity, health outcomes, and self-efficacy for the expected treatment group by time interaction (n=70)

| Variables | Intervention | | Control | | F | P |
|---|---|---|---|---|---|---|
| | Pre-test | Post-test | Pre-test | Post-test | | |
| **Physical activity** | | | | | | |
| Steps | 2710.60±4582.45 | 7813.79±8818.71 | 2763.18±4505.18 | 3734.57±5292.84 | 72.186 | 0.000 |
| Distance | 1.78±3.08 | 5.85±6.00 | 1.86±3.12 | 2.16±2.40 | 69.475 | 0.000 |
| MET | 96.51±169.73 | 254.22±285.25 | 94.29±158.16 | 122.07±172.77 | 46.561 | 0.000 |
| Time | 25.12±41.10 | 69.40±98.87 | 25.24±40.60 | 36.12±55.24 | 16.820 | 0.000 |
| **Health outcomes** | | | | | | |
| BW | 59.74±65.92 | 58.81±65.10 | 58.81±67.13 | 57.92±66.70 | 0.267 | 0.653 |
| BMI | 22.33±24.10 | 21.84±23.62 | 22.10±24.47 | 22.05±24.42 | 0.468 | 0.521 |
| SBP | 119.85±125.37 | 108.08±113.81 | 115.93±123.82 | 114.11±121.23 | 4.029 | 0.031 |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Self-efficacy** | 77.28±95.15 | 80.65±101.82 | 67.97±88.35 | 67.62±87.62 | 3.71 | 0.067 |

3. MET=Metabolic equivalent of task; BW = body weight; BMI = body mass index; SBP = systolic blood pressure