



Overview Of Sedentary Behavior And Physical Activity Level In Fikk Students, State University Of Makassar

By

Muh. Ilham Aksir¹, Yusriani², Abdul Gafur³

¹ Department of Health Promotion, Makassar State University

^{2,3} Department of Public Health, Indonesian Muslim University

Email: muh.ilham.aksir@unm.ac.id¹, yusriani.yusriani@umi.ac.id², abd.gafur@umi.ac.id³

Article Info

Article history:

Received Jun 01, 2026

Revised Jul 28, 2026

Accepted Aug 01, 2026

Keywords:

Sedentary Behavior; Physical Activity; University Students; GPAQ; SBQ

ABSTRACT

Automated Teller Machines (ATMs) generate large volumes of transaction log data, making manual identification of failed cash withdrawal transactions inefficient and error-prone. This study developed ATM Log Validator, a web-based application that automatically validates, filters, and displays failed cash withdrawal transactions from JSON log files. The application was built using HTML, CSS, and JavaScript with a client-side processing approach, ensuring that all data remain within the user's browser to enhance data privacy. The Prototype development method was employed, and system functionality was evaluated using Black Box Testing. Performance was assessed using a simulated dataset of 2,000 transaction logs generated from 50 ATM units across nine locations representing the operational environment of Bank Papua Manokwari Branch during 2021–2024. All functional test scenarios achieved a 100% success rate. The analysis identified 700 cash withdrawal transactions, including 85 failed transactions (12.14%). Failure rates declined from 13.92% in 2021 to 8.38% in 2024, with the highest rates recorded at Hotel Fajaroorn and SPBU Jalan Baru. These results demonstrate that the application effectively supports ATM transaction auditing and reconciliation without requiring additional server infrastructure.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Muh. Ilham Aksir

Department of Health Promotion, Makassar State University

Email: muh.ilham.aksir@unm.ac.id

1. INTRODUCTION

Sedentary behavior is a behavior in a waking state that is carried out in a sitting, leaning, or lying position with very low energy expenditure. This behavior is different from insufficient physical activity. A person can meet weekly physical activity recommendations, but still have high sedentary exposure if most of his daily time is spent sitting without adequate movement breaks (Tremblay et al., 2017; Bull et al., 2020). Therefore, physical activity and sedentary behavior need to be assessed as two components of movement behavior that are related, but not directly replaceable.

Students are a group of young adults who are prone to experiencing sedentary behavior because lecture activities, reading, doing assignments, literature search, academic communication, and digital entertainment are mostly carried out in a sitting position. Systematic studies show that college students spend most of their daily time in sedentary activities, while lifestyle changes when entering college can reduce engagement in structured physical activity (Castro et al., 2020; Edelmann et al., 2022). Habits formed during college are important to pay attention to because this phase is a period of formation of healthy behaviors that can continue into adulthood.

The development of technology-based learning has further strengthened students' sitting patterns. The use of laptops and smartphones to attend lectures, compile documents, access social media, play games, and watch digital content can result in long periods of sitting. Research on late adolescence in Indonesia also showed that the ownership and use of social media accounts was associated with higher sedentary behavior tendencies (Etika et al., 2024). In students, this exposure can occur on weekdays or holidays so that the total sedentary time is formed from various activities accumulated throughout the day.

High sedentary behavior is associated with a variety of health risks, including cardiometabolic disorders, decreased fitness, as well as mental health problems. Studies in college students show that the adverse impact of



sedentary behavior on mental health can be stronger when not accompanied by adequate physical activity (Barbosa et al., 2024). Thus, a student health strategy is not enough to just encourage exercise, but it is also necessary to reduce sitting time and increase the frequency of light activity breaks.

The World Health Organization recommends that adults engage in moderate-intensity aerobic physical activity for 150–300 minutes per week or strenuous intensity activity for 75–150 minutes per week, or an equivalent combination. Physical activity can be done in the domains of work or study, travel, and leisure. *The Global Physical Activity Questionnaire* (GPAQ) measures all three domains in MET-minutes per week, so the picture of student physical activity is not limited to structured exercise (WHO, 2020; WHO, 2021).

The campus environment has an important role because mobility opportunities are influenced by academic schedules, access to facilities, social support, policies, and environmental design. A study by Brown et al. (2024) shows that individual abilities, available opportunities, and motivation are the main factors that affect students' physical activity. An environment that provides open space, walkable access, sports facilities, and an academic culture that supports pause can help students build more active habits (Sommoggy et al., 2020; Ding et al., 2024).

The Faculty of Sports and Health Sciences, State University of Makassar has an academic orientation in the field of sports and health. However, such orientation does not automatically eliminate sedentary risk as academic demands and use of digital devices remain high. An overview of the initial conditions is necessary to know whether the knowledge and environment of health education has been followed by an adequate pattern of activity. This study aims to describe the level of physical activity and sedentary behavior in students of the Physical Education, Health, and Recreation Study Program and the Health Promotion Study Program of FIKK State University of Makassar.

2. METHODS

The research is a descriptive analysis of the initial data at the Analysis stage of the research on the development of a physical activity-based health promotion model. The initial stage uses an observational design with a cross-sectional approach to describe the physical activity and sedentary behavior of students prior to the administration of the intervention. The research was carried out at the Faculty of Sports and Health Sciences, State University of Makassar in the period March-August 2026.

The affordable population is 759 students, consisting of 673 students of the Physical Education, Health, and Recreation Study Program and 86 students of the Health Promotion Study Program. The sample was determined using the Slovin formula with an error rate of 10% and plus 10% to anticipate incomplete data so that 97 respondents were obtained. The selection of respondents used probability sampling using a simple random sampling method. The sample consisted of 52 PJKR students and 45 Health Promotion students.

Physical activity data was collected using *the Global Physical Activity Questionnaire* (GPAQ). The instrument assesses physical activity in the domains of study or work, transportation, and recreation, then converts the frequency and duration of activity into MET-minutes per week. Physical activity levels were categorized into low (<600 MET-minutes/week), moderate (600–2,999 MET-minutes/week), and high ($\geq 3,000$ MET-minutes/week) according to the criteria used in the study.

Sedentary behavior was measured using *the Sedentary Behavior Questionnaire* (SBQ) which recorded the duration of various sitting activities on weekdays and holidays. Activities assessed include watching television, playing computer or video games, listening to music, talking on the phone, working on documents using a computer, reading books or magazines, playing musical instruments, doing works of art or crafts, and sitting while driving or riding a vehicle. The scores were then grouped into low, medium, and high categories based on the study's operational criteria.

The analysis was carried out univariate using frequency and percentage distributions to describe respondent characteristics, indicators of physical activity, categories of physical activity levels, types of sedentary activities, and categories of sedentary behavior. Each prospective respondent receives an explanation of the purpose, benefits, procedures, confidentiality of data, and the right to refuse or resign. Participation is carried out after the respondent gives informed consent.

3. RESEARCH RESULTS

The results of this study involved 97 students taking part in the initial measurement and all data could be analyzed. Respondents came from two study programs with a relatively balanced distribution. PJKR students amounted to 52 people (53.6%), while Health Promotion students amounted to 45 people (46.4%). This can be seen in table 1:

Table 1. Distribution of respondents by study program (n=97)

Study Programs	n	%
Physical Education, Health, and Recreation	52	53,6

Study Programs	n	%
Health Promotion	45	46,4
Total	97	100,0

Source: Primary data, 2026.

A physical activity overview based on the GPAQ domain showed that 34 students (35.1%) engaged in strenuous activity while studying or working, while 74 students (76.3%) reported moderate intensity activity in the domain. A total of 65 students (67.0%) walked or cycled as a means of travel. All three indicators can occur in the same respondent so that the percentage is not mutually exclusive. This can be seen in table 2:

Table 2. Indicators of student physical activity based on GPAQ (n=97)

Physical activity indicators	n	%
Strenuous activities while studying/working	34	35,1
Moderate activity while studying/working	74	76,3
Walking/cycling as transportation	65	67,0

Source: Primary data, 2026. The percentages in each indicator are not mutually exclusive.

Based on the total MET-minutes per week, most students are in the category of moderate physical activity, which is 50 people (51.5%). Students with low physical activity amounted to 30 people (30.9%), while the high category was only 17 people (17.5%). Thus, nearly one-third of respondents have not reached the minimum physical activity limit of 600 MET-minutes per week, and the proportion of students with high physical activity is still relatively small. This can be seen in table 3:

Table 3. Distribution of student physical activity levels (n=97)

Physical activity category	MET-minute/week criteria	n	%
Low	<600	30	30,9
Medium	600–2.999	50	51,5
Height	≥3,000	17	17,5
Total	-	97	100,0

Source: Primary data, 2026.

The results of the SBQ show that students' sedentary behavior is quite prominent on weekdays and holidays. On weekdays, the most commonly reported duration is about 3 hours to watch television and work on documents using the computer, as well as about 4 hours to play computer or video games. On holidays, the duration increases for some activities, namely watching television for 4 to ≥6 hours, playing computer or video games for 3-4 hours, and listening to music for about 5 hours. This pattern shows that leisure time on weekends is filled with screen-based activities and other sitting activities. This can be seen in table 4:

Table 4. Description of the dominant duration of students' sedentary activities in the initial measurement

Sedentary activity	Weekdays	Holidays
Watch television	Generally about 3 hours	Generally 4 hours to ≥6 hours
Playing computers/video games	Generally about 4 hours	Generally 3–4 hours
Working on a document with a computer	Generally about 3 hours	Generally about 4 hours
Sit and listen to music	Generally about 4 hours	Generally about 5 hours
Reading books/magazines	Generally about 4 hours	Generally 2–5 hours
Sitting in a vehicle	Generally about 4 hours	Generally 2–5 hours

Source: Primary data, 2026. Duration shows the dominant answer category in each activity.

The grouping of SBQ scores shows that more than half of students are in the category of high sedentary behavior, namely 57 people (58.8%). A total of 30 students (30.9%) were in the medium category and only 10 students



(10.3%) were in the low category. These findings suggest that high sedentary behavior is still found even though most college students have moderate physical activity. This can be seen in table 5:

Table 5. Distribution of students' sedentary behavior levels (n=97)

Categories of sedentary behavior	n	%
Low	10	10,3
Medium	30	30,9
Height	57	58,8
Total	97	100,0

Source: Primary data, 2026.

4. DISCUSSION

The results showed that the physical activity level of students was most in the moderate category (51.5%), but 30.9% was still in the low category. The proportion of the high category is only 17.5%. The findings show that educational background in the field of sports and health does not guarantee that all students have optimal physical activity. Academic activities can still limit the opportunity to move because students have to attend lectures, read, do assignments, and use digital devices for a long time.

This picture is in line with research by Edelmann et al. (2022) which shows that students' physical activity levels are influenced by gender, age, field of study, education level, and semester. Lifestyle changes while entering college can reduce structured physical activity and increase sitting time. The study by Anwar et al. (2024) that uses GPAQ on students also confirms that there is a variation in the level of physical activity in the campus population, so the activity improvement program needs to be adjusted to the characteristics of students and their academic routines.

At the domain level, 76.3% of students reported moderate-intensity activities while studying or working, while 35.1% were strenuous. In addition, 67.0% use walking or cycling as transportation. The findings show that active behavior capital can be strengthened, especially through active travel and the integration of movement in academic activities. However, the existence of activity in one domain does not necessarily result in a high total physical activity if the frequency or duration is limited. This may explain why the high physical activity category was only found in 17.5% of respondents.

Opportunity and environment factors play a role in determining whether the intention to be active can be realized. Brown et al. (2024) explain that students' physical activity is influenced by ability, opportunity, and motivation. Lecture schedules, availability of facilities, access to open spaces, peer support, and travel habits can reinforce or hinder activities. The study of Sommoggy et al. (2020) also showed that students' design and experience of the campus environment affect daily physical activities. Therefore, campus policies need to optimize pedestrian paths, staircase access, sports facilities, and activities that allow students to move between academic activities.

Another key study is the high prevalence of sedentary behavior. As many as 58.8% of students are in the high category and only 10.3% are in the low category. Notable activities include computer use, document preparation, watching television, playing games, listening to music, reading, and sitting in a vehicle. On holidays, some activities have a dominant duration that is longer than weekdays. This shows that sedentary behavior is not only the result of academic obligations, but is also formed through the choice of leisure activities.

These results are consistent with the study of Castro et al. (2020) which concluded that students are a population with a high level of sedentary levels. Vella and Nelson (2024) also reported that students' sedentary time accumulated through various periods of sitting throughout the day. Screen activity can be an important component because the same devices are used for academic and entertainment needs, making the boundaries between productive sitting and recreational sitting increasingly difficult to separate.

The coexistence of moderate physical activity and high sedentary behavior confirms that physical activity and sedentary activity are not two ends of the same size. Students can walk, participate in sports practices, or engage in moderate activities during certain periods, but still sit for hours while studying, completing assignments, and using digital media. Therefore, a strategy that only adds to the exercise session is not necessarily enough. The intervention needs to have two distinct goals: increasing the volume of physical activity and reducing accumulation and prolonged sitting duration.

The health risks of these patterns need to be a concern. Barbosa et al. (2024) show that sedentary behavior is related to the mental health of college students, and that the impact is stronger when physical activity is inadequate. Memon et al. (2021) also highlighted the relationship between physical activity and students' sleep patterns. Increasing



activity and reducing sitting can help support fitness, stress management, sleep quality, and academic function. However, these benefits need to be further studied using longitudinal design so that the cause-effect relationship can be assessed more robustly.

Classroom interventions can be directed at short pauses in motion, stretching, standing, and active learning. A review by Lynch et al. (2022) shows that movement breaks and physically active learning are feasible to be implemented in college, can reduce sedentary behavior and fatigue, and have the potential to improve focus. Peiris et al. (2021) also found that pauses during lectures can improve student concentration, alertness, and comfort. This approach is relevant because it does not require major changes to the lecture schedule and can be done consistently.

On an individual level, students may be encouraged to stand or walk every 30–60 minutes, use stairs, walk for short trips, limit recreational screen time, and schedule weekly physical activity. At the institutional level, campuses can provide reminder messages, educational media, activity challenges, peer group support, and a safe and comfortable environment to move around. Programs that combine education, social support, and environmental modification are more likely to result in change than information delivery alone.

5. CONCLUSION

Most of the students of FIKK State University of Makassar have a moderate level of physical activity (51.5%), while 30.9% are in the low category and 17.5% are in the high category. At the same time, the majority of students have high sedentary behavior (58.8%), especially in computer use, document processing, watching, playing games, and other screen-based activities. These findings suggest that moderate physical activity can coexist with high sedentary behavior. Campus health efforts need to be directed simultaneously at increasing physical activity and reducing prolonged sitting time.

6. ADVICE

FIKK State University of Makassar is recommended to develop an active campus program through pauses during lectures, optimization of facilities and pedestrian paths, use of stairs, education about the risks of prolonged sitting, and peer-based activities. Students need to increase their physical activity regularly and cut down on sitting time by standing, walking, or doing light stretches every 30–60 minutes. Periodic monitoring using objective measurement tools is necessary to assess the sustainability of behavior change.

REFERENCES

- Anwar, N. I. A., Hasmyati, & Zulfikar, M. (2024). Student Physical Activity Level: Global Physical Activity Questionnaire Study. *Indonesian Journal of Physical Activity*, 4(2), 262–269. <https://doi.org/10.59734/ijpa.v4i2.102>
- Barbosa, B. C. R., Menezes-Júnior, L. A. A. de, de Paula, W., Chagas, C. M. D. S., Machado, E. L., de Freitas, E. D., Cardoso, C. S., de Carvalho Vidigal, F., Nobre, L. N., Silva, L. S. da, & Meireles, A. L. (2024). Sedentary behavior is associated with the mental health of university students during the Covid-19 pandemic, and not practicing physical activity accentuates its adverse effects: Cross-sectional study. *BMC Public Health*, 24(1), 1860. <https://doi.org/10.1186/s12889-024-19345-5>
- Brown, C. E. B., Richardson, K., Halil-Pizzirani, B., Atkins, L., Yücel, M., & Segrave, R. A. (2024). Key influences on university students' physical activity: A systematic review using the Theoretical Domains Framework and the COM-B model of human behaviour. *BMC Public Health*, 24(1), 418. <https://doi.org/10.1186/s12889-023-17621-4>
- Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., et al. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, 54(24), 1451–1462. <https://doi.org/10.1136/bjsports-2020-102955>
- Castro, O., Bennie, J., Vergeer, I., Bosselut, G., & Biddle, S. J. H. (2020). How sedentary are university students? A systematic review and meta-analysis. *Prevention Science*, 21(3), 332–343. <https://doi.org/10.1007/s11121-020-01093-8>
- Deliens, T., Deforche, B., De Bourdeaudhuij, I., & Clarys, P. (2015). Determinants of physical activity and sedentary behaviour in university students: A qualitative study using focus group discussions. *BMC Public Health*, 15, 201. <https://doi.org/10.1186/s12889-015-1553-4>
- Ding, Y., Lee, C., Chen, X., Song, Y., Newman, G., Lee, R., Lee, S., Li, D., & Sohn, W. (2024). Exploring the association between campus environment of higher education and student health: A systematic review of findings and measures. *Urban Forestry & Urban Greening*, 91, 128168. <https://doi.org/10.1016/j.ufug.2023.128168>



- Edelmann, D., Pfirrmann, D., Heller, S., Dietz, P., Reichel, J. L., Werner, A. M., Schäfer, M., Tibubos, A. N., Deci, N., Letzel, S., Simon, P., & Kalo, K. (2022). Physical activity and sedentary behavior in university students—the role of gender, age, field of study, targeted degree, and study semester. *Frontiers in Public Health*, 10, 821703. <https://doi.org/10.3389/fpubh.2022.821703>
- Etika, A. N., Agnes, Y. L. N., Yunalia, E. M., & Prayogi, I. S. (2024). Sedentary behavior in late adolescence based on the number of social media accounts owned. *Holistic Nursing and Health Science*, 6(2), 76–85. <https://doi.org/10.14710/hnhs.6.2.2023.76-85>
- Lynch, J., O'Donoghue, G., & Peiris, C. (2022). Classroom movement breaks and physically active learning are feasible, reduce sedentary behaviour and fatigue, and may increase focus in university students: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 19, 7775. <https://doi.org/10.3390/ijerph19137775>
- Memon, A. R., Gupta, C. C., Crowther, M. E., Ferguson, S. A., Tuckwell, G. A., & Vincent, G. E. (2021). Sleep and physical activity in university students: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 58, 101482. <https://doi.org/10.1016/j.smrv.2021.101482>
- Peiris, C. L., O'Donoghue, G., Rippon, L., Meyers, D., Hahne, A., Noronha, M. D., Lynch, J., & Hanson, L. C. (2021). Classroom movement breaks reduce sedentary behavior and increase concentration, alertness and enjoyment during university classes: A mixed-methods feasibility study. *International Journal of Environmental Research and Public Health*, 18(11), 5589. <https://doi.org/10.3390/ijerph18115589>
- Sommoggy, J. V., Rueter, J., Curbach, J., Helten, J., Tittlbach, S., & Loss, J. (2020). How does the campus environment influence everyday physical activity? A photovoice study among students of two German universities. *Frontiers in Public Health*, 8, 561175. <https://doi.org/10.3389/fpubh.2020.561175>
- Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, S. F. M., Altenburg, T. M., Chinapaw, M. J. M., & SBRN Terminology Consensus Project Participants. (2017). Sedentary Behavior Research Network (SBRN)—Terminology Consensus Project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 75. <https://doi.org/10.1186/s12966-017-0525-8>
- Vella, C. A., & Nelson, M. C. (2024). Patterns and correlates of sedentary behavior among university students. *Journal of American College Health*, 72(9), 3772–3780. <https://doi.org/10.1080/07448481.2023.2198020>
- WHO. (2020). WHO guidelines on physical activity and sedentary behaviour. World Health Organization.
- WHO. (2021). Global Physical Activity Questionnaire (GPAQ). World Health Organization. <https://www.who.int/publications/m/item/global-physical-activity-questionnaire>.