

IU International University of Applied Sciences

Written Assignment

Empirical Social Research (DLBPSESF01_E)

Degree program: Bachelor of Science Applied Psychology

The Short-Term Effect of Daily Aerobic Exercise on Mood

A Randomized Controlled Research Design

Elizaveta Chelnokova

Matriculation Number: 32105607

Submission date: September 21, 2026

Table of Contents

List of Abbreviations.....	III
1 Introduction.....	1
2 Exercise and Mood.....	1
2.1 Conceptualization and Measurement.....	1
2.2 Empirical Evidence and Research Rationale.....	3
3 Research Question and Hypotheses.....	3
4 Proposed Research Design.....	4
4.1 Experimental Design and Participants.....	4
4.2 Variables, Operational Definitions, and Measures.....	5
4.3 Experimental Conditions, Procedure, and Data Analysis.....	5
5 Alternative Explanations and Evaluation of the Design.....	6
5.1 Control of Confounding and Bias.....	6
5.2 Validity, Feasibility, and Limitations.....	7
6 Ethical and Data Protection Considerations.....	8
7 Conclusion.....	9
References.....	10

List of Abbreviations

GDPR	General Data Protection Regulation
PANAS	Positive and Negative Affect Schedule
RCT	Randomized controlled trial
RPE	Rating of perceived exertion

1 Introduction

A single session of exercise is often followed by a short-term improvement in mood. What is less clear is whether exercising every day changes mood over a longer period. A meta-analysis of single-session studies found that mood improved on average, though responses varied substantially across studies (Weinstein et al., 2024, p. 486). Testing this therefore requires comparing people who follow a daily exercise routine with a similar group who do not, assessed over the same period.

This paper proposes a randomized controlled study of the question: Does engaging in 30 minutes of daily exercise affect a person's mood? The proposed participants are insufficiently active adults aged 18 to 55. The exercise is moderate treadmill walking for 14 days, and mood is defined as positive and negative affect over the previous week, measured with the Positive and Negative Affect Schedule (PANAS). The study is a research plan; no participants have been recruited and no findings are reported. It focuses on short-term changes in self-reported affect rather than clinical diagnoses or long-term mental health outcomes.

The paper first explains how exercise and mood are defined and what previous studies suggest. It then sets out the proposed comparison, the measurements and the analysis. Finally, it considers what could complicate the interpretation of any result, including expectations, missed sessions, and the limits of a two-week study.

2 Exercise and Mood

The study needs a specific exercise routine and a way to measure mood. Everyday physical activity is too varied to serve as a consistent intervention, and mood has more than one dimension. The definitions below determine what the proposed comparison can actually show.

2.1 Conceptualization and Measurement

Physical activity and exercise are related but not interchangeable concepts. Caspersen et al. (1985, pp. 126, 128) define physical activity broadly as bodily movement produced by skeletal muscles that results in energy expenditure. Exercise is a narrower category because it is planned, structured, and repetitive, and is performed to improve or maintain physical fitness. The distinction matters here because the intervention needs a repeatable exercise session. Walking to work, cleaning, and climbing stairs count as physical activity, but their duration and intensity vary. In this study, exercise refers to a deliberately scheduled aerobic session rather than movement accumulated during the day.

The exercise condition will be conceptualized as 30 minutes of moderate-intensity indoor treadmill walking on each of 14 consecutive days. Using one activity mode reduces variation that would arise if participants selected different forms of exercise. Conducting the sessions indoors also limits situational influences such as weather, route difficulty, and traffic. Moderate intensity will be assessed through both heart rate and perceived exertion. Guidance published by the American College of Sports Medicine (Zuhl, 2020, p. 1) places moderate aerobic exercise at approximately 65 to 75% of age-predicted maximum heart rate and at a rating of 3 to 4 on a perceived-exertion scale ranging from 0 to 10. Combining an objective physiological indicator with the participant's perceived effort makes the intervention more consistent while acknowledging that the same external workload may not feel equally demanding to every participant.

Mood is a broad construct and cannot be observed directly. In this design, it is represented by two measurable dimensions: positive affect and negative affect. The two are not opposite ends of one scale. Before an exam, a person might feel enthusiastic and nervous at the same time. The Positive and Negative Affect Schedule (PANAS) was developed to measure the two dimensions separately through two 10-item scales. Watson et al. (1988, p. 1063) reported that the two scales showed strong internal consistency and appropriate evidence of convergent and discriminant validity. This makes the instrument suitable for detecting whether exercise is associated with an increase in positive affect, a decrease in negative affect, or a combination of both.

Participants will complete the standard 20-item PANAS before allocation and after the 14-day program. On both occasions, they will rate how strongly they experienced each state during the previous week. This period was chosen to capture more than an immediate reaction to the last session. Responses use a five-point scale; summing the 10 items for each dimension gives separate positive- and negative-affect scores from 10 to 50 (Office of Geriatrics and Gerontology, n.d., pp. 1–2). The questionnaire will be given at roughly the same time of day on both occasions. What matters is whether the change in each score differs between the groups, not whether one group happens to have a favorable score at the end.

These scores capture only part of what people mean by mood. They are not diagnoses of depression or another disorder. Participants may misremember the week or answer differently because they expect exercise to help. Standard instructions, private responses, and an active comparison group help, but none removes these problems completely. The advantage of the PANAS is that it gives the study two clearly defined outcomes that can be measured in both groups.

2.2 Empirical Evidence and Research Rationale

Research suggests that a single exercise session can be followed by an improvement in mood, although the size of the response varies. Weinstein et al. (2024, p. 486) combined data from 103 studies with 4,671 participants in a meta-analysis of acute exercise. General mood improved between measurements taken before exercise and within 30 minutes after it, with a small-to-moderate average effect (Hedges' $g = 0.336$). The authors also found considerable variation across studies that was not explained by the exercise characteristics and participant factors they examined. Their findings support the possibility of a mood benefit, but an immediate change after one session cannot by itself establish what happens across two weeks of daily activity.

An experimental example comes from Nouchi et al. (2020, pp. 1–3, 7). In their randomized trial, middle-aged and older women completed one 30-minute session combining aerobic, strength, and stretching exercises, while the comparison group waited without exercising. The exercise group showed a greater increase in vigor-activity mood than the comparison group. However, mood was a secondary outcome, the participants were women recruited through an exercise gym, and the control activity was simply waiting. The result therefore provides a useful indication that 30 minutes of exercise may affect one aspect of mood, while leaving open whether repeated moderate walking produces a similar response in insufficiently active adults, including men.

Together, these studies give a reason to test repeated walking, but they cannot predict the outcome. The proposed study uses the same 30-minute walking routine for 14 days and measures positive and negative affect separately before and after it. The seated group follows the same schedule. Fourteen days is a manageable period for daily sessions, not a known threshold for mood change. Comparing the groups helps separate a possible effect of walking from changes that happen simply because time passes or people attend the study site.

3 Research Question and Hypotheses

The research question is: Among insufficiently active adults aged 18 to 55, does completing 30 minutes of moderate-intensity treadmill walking each day for 14 days lead to a different change in mood than spending the same time in a seated comparison activity? Here, mood refers specifically to the positive- and negative-affect scores on the PANAS, measured before the intervention and after its final day. This wording identifies the participants, the exercise program, the comparison, and the outcomes that would allow the question to be examined.

The first hypothesis is that participants assigned to daily walking will show a greater increase in positive affect from baseline to the end of the 14 days than participants assigned to the seated comparison activity. The second hypothesis is that the walking group will show a greater decrease in negative affect over the same period than the comparison group. These are directional predictions based on evidence that a single exercise session can improve aspects of mood (Nouchi et al., 2020, p. 7; Weinstein et al., 2024, p. 486). Because that evidence mainly concerns immediate responses, the present hypotheses about repeated daily exercise remain open to testing.

A change within the walking group alone would not settle the question, since mood could also change over two weeks in the seated group. The test is whether the groups differ after accounting for their starting scores, with positive and negative affect examined separately. Neither prediction is assumed to be true.

4 Proposed Research Design

A two-group randomized controlled trial (RCT) would compare people assigned to walk with people assigned to a seated activity. Both groups would be measured at the same times and have similar contact with study staff. This makes the assigned activity the main planned difference between them.

4.1 Experimental Design and Participants

The proposed sample is 80 adults aged 18 to 55, with 40 assigned to each group. Recruitment would use community advertisements and university mailing lists rather than a clinical service. This number is a practical planning target, not a sample size proven adequate to detect a particular effect. Before a real study begins, the target would be checked with a formal sample-size calculation based on a defensible expected difference and allowance for missed sessions or withdrawal.

Eligible volunteers would report fewer than 150 minutes of moderate physical activity per week during the previous month. This threshold reflects the World Health Organization's minimum weekly recommendation

for adults and gives 'insufficiently active' a clear meaning (World Health Organization, 2024). Interested people would complete a brief activity and health screening. A person would not take part if a current health concern made moderate walking unsafe or if a clinician advised against it; uncertain cases would require appropriate medical clearance before enrollment. People already following a structured exercise program would also be excluded, because the intended contrast is the introduction of a new daily activity. These criteria protect participants and reduce variation in previous exercise habits, although they narrow the population to which the findings could apply.

After informed consent and the baseline PANAS, an independent researcher would use a computer-generated random sequence to assign participants in a 1:1 ratio. Allocation would be concealed from the person enrolling participants until their baseline assessment was complete. Random assignment aims to distribute measured and unmeasured pre-existing differences across groups, although chance imbalances can remain with a sample of 80. Participants will know whether they are walking, but the person entering and analyzing the PANAS scores can receive only coded group labels until the main analysis is complete.

4.2 Variables, Operational Definitions, and Measures

The independent variable is assignment to one of two conditions: 30 minutes of moderate treadmill walking each day or 30 minutes of a seated, neutral informational activity each day. Both conditions last 14 consecutive days and take place in the same indoor facility. Assignment is the variable used for the main comparison; the number of sessions actually completed is recorded separately as adherence. This distinction matters because participants who miss sessions may differ from those who complete them in motivation, health, or baseline mood.

The dependent variables are the positive-affect and negative-affect subscale scores of the 20-item PANAS (Watson et al., 1988, p. 1063). Both are assessed before the first session and after the last session, using the instruction to consider feelings during the previous week. The baseline assessment therefore describes the week before enrollment, while the final assessment chiefly covers days 8 to 14 of the program. It does not directly measure mood during the first seven intervention days or an immediate response to each session. A higher positive-affect score and a lower negative-affect score would represent changes in the predicted directions; each outcome will be examined separately.

The treadmill timer will record how long each participant walks. Staff will check heart rate and a rating of perceived exertion (RPE) from 0 to 10 during the session, adjusting the pace to keep the effort moderate as described in Section 2.1. They will also record attendance, minutes walked, and reasons for stopping early. In both groups, a short daily log will note extra exercise, unusually poor sleep, illness, and major stressful events. These details may help explain unusual responses, but the PANAS scores remain the main outcomes.

4.3 Experimental Conditions, Procedure, and Data Analysis

At enrollment, all volunteers would receive the same short briefing: the study compares two daily activities and their effect on mood over two weeks. After screening, consent, and the baseline questionnaire, random assignment would take place. Both groups would attend a scheduled 30-minute session at approximately the same time of day for 14 consecutive days. To make daily attendance more realistic, sessions could be offered

across several time slots, with each participant keeping roughly the same slot. Research staff would use the same brief welcome and departure routine in both conditions and would avoid suggesting that one activity ought to improve mood.

Walking participants would use an indoor treadmill, with pace adjusted to the planned moderate effort and monitored throughout the session. They could slow down or stop at any time. Comparison participants would spend 30 minutes seated with neutral, non-exercise informational material in a similar room and with comparable staff contact. This active condition helps account for attendance, a structured daily routine, and attention from staff. However, seated material might itself affect mood, and participants cannot be blinded to their activity. Both groups would be asked to keep their usual activities outside the study, rather than deliberately start another exercise program; any additional activity would be recorded rather than assumed absent.

The final PANAS would be completed after the day-14 session, at approximately the same time of day as the baseline questionnaire. The instruction referring to the previous week would be printed identically at both assessments. Questionnaires would be completed privately, without a supervisor watching the answers. The scheduled sessions and logs would show whether the exercise was delivered as planned, while the two PANAS measurements would show whether the groups differed in their change in affect. A brief question about which activity participants expected to improve mood could help interpret possible expectation effects, provided it is asked before allocation.

For each PANAS subscale, the main analysis would compare the groups' final scores while adjusting for the corresponding baseline score. The group difference, its confidence interval, and the number of participants contributing data would be reported for positive and negative affect separately. The primary comparison would follow participants' original random assignments, even if some missed sessions, to avoid selecting only highly adherent participants. Missing final questionnaires would be described by group and reason; a sensitivity analysis would examine whether reasonable assumptions about missing responses change the conclusion. These planned analyses would test the hypotheses, but no result or statistical significance can be claimed from a proposed design.

5 Alternative Explanations and Evaluation of the Design

Even if the two groups report different moods after 14 days, walking may not be the only reason. Expectations, events outside the study, and missed sessions could also matter. Random assignment and a seated comparison help address these possibilities, although they cannot settle every one of them.

5.1 Control of Confounding and Bias

Sleep, stress from work or study, illness, medication changes, and exercise outside the study could each influence the PANAS scores during the two weeks. Some volunteers may already expect walking to help, and that expectation can change how they report their mood. Random assignment makes systematic baseline differences less likely, while keeping both groups on the same timetable and recording major changes in a daily log helps identify imbalances that develop later. Those logs cannot measure every influence accurately,

and adjusting for events that arise after randomization would require care because some might themselves be affected by the intervention.

The seated group also travels to the facility and spends time with staff, which makes it a more useful comparison than a group with no contact with the study at all. Even so, the two activities may differ in enjoyment, physical sensations, and what participants expect from them. Neutral descriptions, private questionnaires, and a data analyst who does not know the group labels can reduce bias, but participants themselves will know what they are doing. A difference in scores would therefore reflect the walking routine, including possible expectation effects; it could not be attributed solely to a physical effect of exercise.

Changes over time that affect everyone, such as a stressful local event or seasonal conditions, should tend to appear in both groups; the main question is whether the change differs between them. Randomization is less effective if many participants discontinue one condition or if control participants begin exercising on their own. Attendance records, reasons for dropout, and reports of outside activity would therefore be presented alongside the mood outcomes. If one group has substantially more missing final questionnaires, the strength of a causal interpretation would be reduced even when the analysis retains original assignment.

5.2 Validity, Feasibility, and Limitations

The study has reasonable internal validity for comparing two assigned routines because the activities, duration, site, and measurement schedule are specified in advance. It measures the selected construct consistently using the same PANAS subscales at both time points. Still, self-reported affect over a week is a narrower outcome than 'mood' in ordinary speech. Recall and social desirability may affect answers, and a questionnaire completed immediately after the last session could still be influenced by how that session felt despite its past-week wording. A follow-up assessment several weeks later would be needed to test persistence, but it is outside this short-term design.

The findings would also apply only to a specific group. People who agree to 14 daily visits may have more time or motivation than other insufficiently active adults. The activity is treadmill walking, so a result cannot automatically be extended to vigorous exercise, outdoor walking, older adults, or people unable to use a treadmill. It also cannot show whether 14 days is the shortest or best program. Any report of the findings would need to state these limits.

Daily supervised sessions require staff time, treadmills, and rooms, including on weekends. Flexible slots, reminders, and a pilot of the screening and scheduling process could improve feasibility. A formal sample-size calculation might also change the recruitment target. Attendance problems and missing responses could still weaken the precision of the estimate.

6 Ethical and Data Protection Considerations

Participation would be voluntary and begin only after people receive understandable information about the activities, questionnaires, time commitment, and possible discomfort. They could refuse an item or leave the study without giving a reason or losing any benefit. Research approval would be obtained before recruitment. Screening and supervision would reduce avoidable physical risks, but walking could still cause fatigue,

discomfort, or a fall. Staff would explain how to stop the treadmill safely and would stop a session if a participant reported concerning symptoms. A missed or shortened session would be recorded without pressure to make it up unsafely.

PANAS responses and screening information are personal data. In line with the General Data Protection Regulation's data minimization principle, the study would collect only information needed for screening, scheduling, and the specified outcomes (Regulation (EU) 2016/679, Art. 5(1)(c)). Participants would be assigned codes, and contact details would be stored separately from questionnaire responses. Access to identifiable records would be limited to authorized study staff; reporting would use group summaries rather than names. The consent materials would explain who holds the records, how long they are retained, and how participants can ask questions about their data under the institution's approved procedures. The proposed control group would be offered the walking program after the final assessment if it proved practical and safe, so participation need not permanently restrict access to it.

7 Conclusion

This paper proposes a way to test whether 30 minutes of daily exercise affects mood. Insufficiently active adults would be assigned to two weeks of moderate treadmill walking or a seated activity with the same daily schedule. Their positive and negative affect would be measured before and after the program. The key comparison is the difference between the groups after accounting for where each group started. Attendance, walking intensity, and events outside the sessions would help explain the findings.

Random assignment and similar staff contact make that comparison stronger, but they do not remove every alternative explanation. Participants know which activity they perform, and their expectations may influence their answers. Some may miss sessions or take up exercise outside the study. The PANAS asks about the previous week, so the final score mostly reflects the second week and cannot show exactly when a change occurred. A study with more frequent measurements could answer that question.

Previous research gives grounds for the hypotheses, but it mostly concerns the response to one exercise session. Whether the same pattern appears after two weeks remains unknown. If a study using this design found a difference, it would speak to this supervised walking routine and the people recruited for it. It could not establish what happens with other forms of exercise or whether a mood change lasts. Those questions would require further research, along with a sample size justified before recruitment.

References

- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, 100(2), 126–131. <https://stacks.cdc.gov/view/cdc/66195>
- Nouchi, R., Nouchi, H., & Kawashima, R. (2020). A single 30 minutes bout of combination physical exercises improved inhibition and vigor-mood in middle-aged and older females: Evidence from a randomized controlled trial. *Frontiers in Aging Neuroscience*, 12, Article 179. <https://doi.org/10.3389/fnagi.2020.00179>
- Office of Geriatrics and Gerontology. (n.d.). *Positive and Negative Affect Schedule (PANAS-SF)* [Measurement instrument]. The Ohio State University. <https://ogg.osu.edu/media/documents/MB%20Stream/PANAS.pdf>
- Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation), OJ L 119, 4.5.2016, pp. 1–88. <https://eur-lex.europa.eu/eli/reg/2016/679/oj/eng>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063–1070. <https://doi.org/10.1037/0022-3514.54.6.1063>
- Weinstein, A. A., van Aert, R. C. M., Donovan, K., Muskens, L., & Kop, W. J. (2024). Affective responses to acute exercise: A meta-analysis of the potential beneficial effects of a single bout of exercise on general mood, anxiety, and depressive symptoms. *Psychosomatic Medicine*, 86(6), 486–497. <https://doi.org/10.1097/PSY.0000000000001321>
- World Health Organization. (2024, June 26). *Physical activity*. <https://www.who.int/news-room/fact-sheets/detail/physical-activity>
- Zuhl, M. (2020). *Tips for monitoring aerobic exercise intensity* [Infographic]. American College of Sports Medicine. <https://acsm.org/wp-content/uploads/2025/02/Exercise-intensity-infographic-PDF.pdf>