International Journal of Physical Education, Exercise and Sports
www.physicaleducationjournal.com
Online ISSN: 2664-9896
Received: 30-04-2026, Accepted: 31-05-2026, Published: 15-06-2026
Volume 8, Issue 2, 2026, Page No. 104-110

Determinants of exercise adherence among middle-aged adults

Nguyen Thanh Cao*
Physical Education Center, University of Finance & Marketing, Ho Chi Minh City, Vietnam
DOI: https://doi.org/10.66856/ijpees.2026.8.2.8043

Abstract
This study investigates the determinants of exercise adherence among middle-aged adults in Vietnam, focusing on the roles of health motivation, social support, exercise self-efficacy, and digital health technology use. A quantitative research approach was employed, and data were collected from 487 middle-aged adults aged 40 to 60 years through a structured questionnaire. The proposed model was analyzed using SPSS 26.0 and SmartPLS 4.0. The results revealed that all four factors significantly and positively influence exercise adherence. Exercise self-efficacy was identified as the strongest predictor, followed by health motivation, digital health technology use, and social support. The findings indicate that individuals who possess greater confidence in their ability to exercise, stronger health-related motivation, higher levels of social support, and more frequent use of digital health technologies are more likely to maintain long-term participation in physical activity. The proposed model explained 61.2% of the variance in exercise adherence. These findings provide important implications for health promotion programs, fitness organizations, and policymakers seeking to encourage active lifestyles and healthy aging among middle-aged adults in Vietnam.

Keywords: Exercise adherence, health motivation, social support, exercise self-efficacy, digital health technology, middle-aged adults, Vietnam

Introduction

Regular physical activity is widely recognized as one of the most effective strategies for maintaining health, preventing chronic diseases, and enhancing overall quality of life. Extensive evidence has demonstrated that regular exercise contributes to improved cardiovascular health, weight management, musculoskeletal fitness, mental well-being, and longevity. As populations around the world continue to age, promoting sustained participation in physical activity has become a major public health priority. However, while many individuals initiate exercise programs, maintaining long-term exercise adherence remains a significant challenge.

Exercise adherence refers to the extent to which individuals consistently engage in planned physical activity over time. It is considered a critical determinant of the effectiveness of exercise interventions because health benefits can only be achieved when physical activity is maintained regularly. Previous studies have shown that dropout rates from exercise programs remain relatively high, particularly among adults facing occupational responsibilities, family commitments, and health-related constraints. Consequently, understanding the factors that influence exercise adherence has become an important research area in public health, sports science, and health promotion.

Middle-aged adulthood represents a particularly important life stage for investigating exercise adherence. Generally defined as the period between 40 and 60 years of age, middle adulthood is often characterized by increasing work responsibilities, family obligations, and age-related physiological changes. During this period, individuals become more vulnerable to chronic health conditions such as hypertension, diabetes, obesity, cardiovascular disease, and musculoskeletal disorders. Regular physical activity can play a vital role in preventing or managing these health conditions. Nevertheless, many middle-aged adults struggle to maintain consistent exercise routines due to competing demands and lifestyle constraints.

In recent years, Vietnam has experienced significant demographic and epidemiological transitions. Improvements in healthcare and living standards have increased life expectancy, while rapid urbanization and economic development have contributed to more sedentary lifestyles. As a result, the prevalence of non-communicable diseases has increased substantially among middle-aged and older adults. These trends have highlighted the importance of promoting active lifestyles and encouraging long-term exercise participation among the adult population.

Despite widespread recognition of the benefits of physical activity, exercise adherence among middle-aged adults remains relatively low in many countries, including Vietnam. Previous research suggests that multiple factors influence individuals' decisions to continue or discontinue exercise participation. These factors may include personal motivations, psychological characteristics, social influences, environmental conditions, and technological support systems. Identifying the most influential determinants of exercise adherence is therefore essential for developing effective intervention strategies.

Among personal factors, health motivation has been consistently identified as an important predictor of exercise behavior. Individuals who perceive exercise as a means of improving health, preventing illness, and maintaining physical fitness are generally more likely to engage in regular physical activity. Health-related motivations become increasingly important during middle adulthood, when concerns regarding aging and chronic disease prevention become more prominent.

Social support is another critical factor associated with exercise adherence. Support from family members, friends, colleagues, and community networks can provide encouragement, accountability, and emotional

reinforcement that facilitate continued participation in physical activity. Previous studies have demonstrated that individuals who receive greater social support are more likely to maintain exercise routines and achieve long-term health goals.

Exercise self-efficacy, defined as an individual's confidence in their ability to successfully perform and maintain exercise behaviors, has also been widely recognized as a strong predictor of physical activity participation. According to Social Cognitive Theory, individuals with higher self-efficacy are more likely to overcome barriers, persist in challenging situations, and maintain desired behaviors over time. Therefore, self-efficacy may play a crucial role in determining exercise adherence among middle-aged adults.

In addition to traditional determinants, digital health technologies have emerged as increasingly important tools for supporting physical activity behaviors. Mobile health applications, wearable fitness trackers, smartwatches, online exercise programs, and digital coaching platforms provide users with opportunities to monitor activity levels, set goals, receive feedback, and track progress. The growing adoption of digital health technologies has created new possibilities for promoting exercise adherence and supporting healthy lifestyles among adults. However, empirical evidence regarding their effectiveness in the Vietnamese context remains limited.

Although previous studies have investigated exercise participation and health behaviors among adults, relatively few studies have simultaneously examined the roles of health motivation, social support, self-efficacy, and digital health technology use in explaining exercise adherence among middle-aged adults in Vietnam. Furthermore, the interaction of these factors within a comprehensive conceptual framework has received limited attention. Addressing this research gap is important for understanding how different determinants influence exercise adherence and for designing effective health promotion interventions.

Therefore, this study aims to investigate the determinants of exercise adherence among middle-aged adults in Vietnam, focusing on the roles of health motivation, social support, exercise self-efficacy, and digital health technology use. The findings are expected to contribute to the existing literature on exercise behavior and provide practical implications for policymakers, healthcare professionals, fitness organizations, and community health programs seeking to promote active lifestyles and healthy aging among middle-aged adults in Vietnam.

Literature Review and Hypothesis Development

Health Motivation and Exercise Adherence

Health motivation refers to an individual's desire to engage in behaviors that improve or maintain physical and psychological well-being. According to the Health Belief Model, individuals are more likely to adopt health-related behaviors when they perceive significant benefits and recognize potential health risks associated with inactivity. For middle-aged adults, concerns regarding chronic disease prevention, weight management, physical fitness, and healthy aging often serve as strong motivational factors for engaging in exercise.

Previous studies have consistently demonstrated that health motivation is positively associated with physical activity participation and long-term exercise adherence. Individuals who exercise primarily for health-related reasons are more likely to establish regular exercise habits and maintain participation over time. As middle-aged adults become increasingly aware of age-related health risks, health motivation may play an even more important role in sustaining exercise behavior.

Therefore, the following hypothesis is proposed:

H1: Health motivation positively influences exercise adherence among middle-aged adults.

Social Support and Exercise Adherence

Social support refers to the emotional, informational, and practical assistance individuals receive from family members, friends, colleagues, and community networks. Social support has been widely recognized as an important determinant of health-related behaviors, including physical activity participation.

Individuals who receive encouragement from family and friends are often more motivated to maintain exercise routines. Social support may reduce psychological barriers, increase accountability, and provide positive reinforcement that facilitates long-term adherence. Furthermore, participation in group-based exercise programs and community fitness activities may strengthen social relationships and improve exercise commitment.

Previous research has shown that social support significantly predicts exercise participation among adults and older populations. Individuals who perceive higher levels of social support generally demonstrate greater persistence in physical activity programs.

Based on these arguments, the following hypothesis is proposed:

H2: Social support positively influences exercise adherence among middle-aged adults.

Exercise Self-Efficacy and Exercise Adherence

Exercise self-efficacy refers to an individual's confidence in their ability to successfully perform and maintain regular exercise despite challenges and obstacles. Self-efficacy is a central concept within Social Cognitive Theory and has been extensively applied in studies of health behavior and physical activity.

Individuals with high exercise self-efficacy tend to view challenges as manageable and are more likely to persist when facing barriers such as lack of time, fatigue, unfavorable weather conditions, or competing responsibilities. Conversely, individuals with low self-efficacy are more likely to discontinue exercise when confronted with difficulties.

Numerous empirical studies have identified self-efficacy as one of the strongest predictors of exercise adherence. Individuals who believe they can successfully maintain exercise routines are more likely to engage in regular physical activity and sustain participation over extended periods.

Accordingly, the following hypothesis is proposed:

H3: Exercise self-efficacy positively influences exercise adherence among middle-aged adults.

Digital Health Technology Use and Exercise Adherence

The rapid development of digital health technologies has created new opportunities for promoting healthy lifestyles

and supporting exercise behaviors. Digital health technologies include mobile fitness applications, wearable activity trackers, smartwatches, online exercise platforms, and virtual coaching systems.

These technologies provide users with various functions, including activity monitoring, goal setting, performance feedback, personalized recommendations, and social interaction. Such features may increase users' awareness of their physical activity behaviors and encourage long-term engagement in exercise.

Previous studies have suggested that digital health technologies can positively influence exercise adherence by enhancing motivation, self-monitoring, and behavioral reinforcement. The increasing accessibility of smartphones and wearable devices has made digital health technologies particularly relevant for middle-aged adults seeking convenient methods to manage their health and fitness.

Therefore, the following hypothesis is proposed:

H4: Digital health technology use positively influences exercise adherence among middle-aged adults.

Research Model

Based on the literature review and theoretical foundations, the proposed research model consists of four independent variables and one dependent variable.

Independent Variables

- Health Motivation (HM)
- Social Support (SS)
- Exercise Self-Efficacy (SE)
- Digital Health Technology Use (DT)

Dependent Variable

- Exercise Adherence (EA)

Hypothesized Relationships

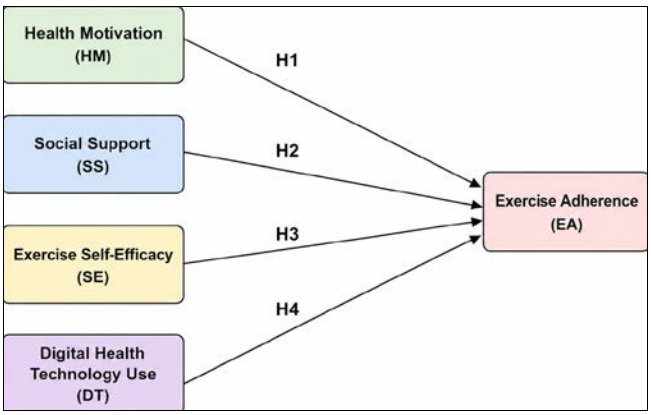

Fig 1: Research Model of the Determinants of Exercise Adherence among Middle-Aged Adults

The proposed model assumes that Health Motivation, Social Support, Exercise Self-Efficacy, and Digital Health Technology Use directly and positively influence Exercise Adherence among middle-aged adults in Vietnam.

Methodology

Research Design

This study employed a quantitative research approach to investigate the determinants of exercise adherence among middle-aged adults in Vietnam. The research model was developed based on previous studies related to health behavior, physical activity participation, social cognitive theory, and digital health technology adoption. A cross-sectional survey design was adopted to collect empirical data and test the proposed hypotheses.

Participants

The target population consisted of middle-aged adults aged between 40 and 60 years residing in Vietnam. Participants were recruited from fitness centers, community sports clubs, walking groups, health promotion programs, and recreational exercise organizations.

A convenience sampling method was employed. A total of 550 questionnaires were distributed, of which 487 valid responses were retained for statistical analysis after data screening and removal of incomplete questionnaires.

Demographic Characteristics

The questionnaire collected information regarding:

- Gender
- Age
- Educational level
- Occupation
- Exercise frequency
- Exercise experience
- Use of digital health technologies

Measurement Instruments

All constructs were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Health Motivation (HM)

HM1. I exercise to maintain my physical health.
HM2. I exercise to prevent chronic diseases.
HM3. Maintaining good health motivates me to exercise regularly.
HM4. I believe exercise improves my quality of life.
HM5. Health benefits encourage me to continue exercising.

Social Support (SS)

SS1. My family encourages me to exercise regularly.
SS2. My friends support my exercise activities.
SS3. I receive encouragement from people around me.
SS4. Exercising with others motivates me to continue.
SS5. Social relationships help me maintain exercise habits.

Exercise Self-Efficacy (SE)

SE1. I am confident that I can exercise regularly.
SE2. I can continue exercising even when I am busy.
SE3. I can overcome obstacles that prevent exercise.
SE4. I can maintain exercise habits over time.
SE5. I believe I can achieve my exercise goals.

Digital Health Technology Use (DT)

DT1. I use fitness applications to monitor my exercise activities.
DT2. I use wearable devices to track physical activity.
DT3. Digital technologies help me manage my health.
DT4. Online exercise resources support my exercise routine.
DT5. Digital technologies motivate me to continue exercising.

Exercise Adherence (EA)

EA1. I exercise regularly every week.
EA2. I maintain my exercise schedule consistently.

EA3. I rarely skip planned exercise sessions.
EA4. I have sustained exercise participation for a long period.
EA5. I intend to continue exercising in the future.

Data Collection Procedure

Data collection was conducted from January to April 2026. Both online and paper-based questionnaires were used. Participation was voluntary, and respondents were informed about the objectives of the study. Confidentiality and anonymity were guaranteed throughout the research process.

Data Analysis

The collected data were analyzed using SPSS 26.0 and SmartPLS 4.0.

The analytical procedure included:

1. Descriptive statistics.
2. Reliability analysis using Cronbach's Alpha.
3. Convergent validity assessment using Composite Reliability (CR) and Average Variance Extracted (AVE).
4. Discriminant validity assessment using HTMT.
5. Structural Equation Modeling (PLS-SEM).
6. Bootstrapping analysis for hypothesis testing.
7. Evaluation of explanatory power using R^2 values.

Results

1. Respondent Profile

A total of 487 valid questionnaires were collected from middle-aged adults aged between 40 and 60 years. Among the respondents, 238 (48.9%) were male and 249 (51.1%) were female. Regarding age distribution, 39.4% were aged 40–49 years, while 60.6% were aged 50–60 years. The majority of respondents reported exercising at least three times per week.

Table 1: Demographic Characteristics of Respondents (n = 487)

Characteristics	Frequency	Percentage (%)
Male	238	48.9
Female	249	51.1
Age 40–49	192	39.4
Age 50–60	295	60.6
Exercise 1–2 times/week	113	23.2
Exercise 3–4 times/week	216	44.4
Exercise ≥5 times/week	158	32.4

The results indicate that most respondents maintained relatively regular exercise habits, providing an appropriate sample for investigating exercise adherence.

2. Reliability and Convergent Validity

The reliability and convergent validity of the measurement model were evaluated using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

Table 2: Reliability and Convergent Validity Results

Construct	Cronbach's Alpha	CR	AVE
Health Motivation (HM)	0.902	0.927	0.717
Social Support (SS)	0.887	0.918	0.692
Exercise Self-Efficacy (SE)	0.911	0.934	0.739
Digital Health Technology Use (DT)	0.895	0.923	0.706
Exercise Adherence (EA)	0.918	0.938	0.752

All Cronbach's Alpha values exceeded 0.70, indicating satisfactory internal consistency. Similarly, CR values were above 0.70 and AVE values exceeded 0.50, confirming adequate convergent validity.

3. Discriminant Validity Assessment

Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT).

Table 3: HTMT Results

Constructs	HM	SS	SE	DT	EA
HM	-				
SS	0.621	-			
SE	0.593	0.664	-		
DT	0.512	0.547	0.615	-	
EA	0.711	0.684	0.773	0.628	-

All HTMT values were below the threshold of 0.85, indicating satisfactory discriminant validity among the constructs.

4. Structural Model Assessment

The proposed hypotheses were tested using bootstrapping procedures in SmartPLS.

Table 4: Hypothesis Testing Results

Hypothesis	Relationship	β	t-value	p-value	Result
H1	HM → EA	0.294	5.876	<0.001	Supported
H2	SS → EA	0.187	3.954	<0.001	Supported
H3	SE → EA	0.372	7.241	<0.001	Supported
H4	DT → EA	0.211	4.386	<0.001	Supported

The results indicate that all four determinants significantly influenced exercise adherence among middle-aged adults. Exercise Self-Efficacy demonstrated the strongest effect on Exercise Adherence (β = 0.372), followed by Health Motivation (β = 0.294), Digital Health Technology Use (β = 0.211), and Social Support (β = 0.187).

5. Coefficient of Determination (R^2)

Table 5: Explanatory Power of the Model

Dependent Variable	R^2
Exercise Adherence (EA)	0.612

The R^2 value of 0.612 indicates that Health Motivation, Social Support, Exercise Self-Efficacy, and Digital Health Technology Use jointly explained 61.2% of the variance in Exercise Adherence. According to Hair et al. (2022), this represents substantial explanatory power.

6. Importance Ranking of Determinants

Table 6: Ranking of Determinants Affecting Exercise Adherence

Determinant	β	Rank
Exercise Self-Efficacy	0.372	1
Health Motivation	0.294	2
Digital Health Technology Use	0.211	3
Social Support	0.187	4

The ranking results suggest that Exercise Self-Efficacy is the most influential determinant of exercise adherence among middle-aged adults in Vietnam. Individuals who

possess greater confidence in their ability to maintain exercise routines are more likely to sustain long-term participation in physical activity. Health Motivation and Digital Health Technology Use also play important roles in encouraging exercise adherence, while Social Support contributes positively but to a lesser extent.

Overall, the findings provide strong empirical evidence that psychological, social, and technological factors collectively influence exercise adherence among middle-aged adults. The proposed model demonstrates substantial predictive power and supports all four research hypotheses.

Discussion

The purpose of this study was to investigate the determinants of exercise adherence among middle-aged adults in Vietnam, focusing on the roles of health motivation, social support, exercise self-efficacy, and digital health technology use. The findings provide valuable insights into the factors that influence long-term exercise participation and contribute to the growing literature on health promotion and active aging in developing countries.

One of the most important findings of this study is that exercise self-efficacy emerged as the strongest predictor of exercise adherence among middle-aged adults. The results indicate that individuals who possess greater confidence in their ability to maintain regular exercise routines are more likely to sustain long-term participation in physical activity. This finding is consistent with Social Cognitive Theory, which emphasizes self-efficacy as a key determinant of behavioral persistence. Individuals with high self-efficacy are generally better able to overcome barriers such as lack of time, fatigue, unfavorable weather conditions, and competing responsibilities. Consequently, they are more likely to maintain exercise habits even when faced with challenges. The strong influence of self-efficacy identified in this study suggests that interventions aimed at improving confidence and exercise-related skills may significantly enhance exercise adherence among middle-aged adults.

The findings also demonstrate that health motivation has a significant positive effect on exercise adherence. Middle-aged adults who are motivated by health improvement, disease prevention, and healthy aging are more likely to engage in regular physical activity and maintain exercise behaviors over time. This result is understandable because middle adulthood is often associated with increasing awareness of health risks and age-related physical changes. Concerns regarding chronic diseases such as hypertension, diabetes, obesity, and cardiovascular disorders may encourage individuals to adopt healthier lifestyles. Therefore, health-related motivations serve as powerful drivers of sustained exercise participation. The findings support previous research suggesting that perceived health benefits are among the most influential factors affecting exercise behavior in adult populations.

Another important finding is the positive influence of digital health technology use on exercise adherence. The results indicate that middle-aged adults who utilize fitness applications, wearable devices, smartwatches, and online exercise resources demonstrate higher levels of exercise adherence. This finding reflects the growing importance of digital technologies in health management and lifestyle modification. Digital health technologies provide users with convenient tools for monitoring physical activity, tracking progress, setting exercise goals, and receiving real-time feedback. Such features may increase self-awareness and encourage individuals to maintain regular exercise routines. Furthermore, digital technologies offer flexibility and accessibility, allowing users to engage in health-related activities regardless of time and location constraints. In the context of rapid digital transformation in Vietnam, the integration of digital health technologies may represent an effective strategy for promoting physical activity among middle-aged adults.

The study further reveals that social support significantly contributes to exercise adherence, although its influence is weaker than those of self-efficacy and health motivation. Individuals who receive encouragement from family members, friends, colleagues, and community networks are more likely to maintain exercise participation. Social support may provide emotional encouragement, practical assistance, and accountability that facilitate behavioral persistence. In addition, exercising with others may increase enjoyment and reduce feelings of isolation. The positive effect of social support identified in this study highlights the importance of interpersonal relationships in promoting healthy lifestyles. Community-based exercise programs and family-oriented health initiatives may therefore contribute to improving exercise adherence among middle-aged adults.

The explanatory power of the proposed model further demonstrates the importance of psychological, social, and technological factors in understanding exercise adherence. The four determinants jointly explained a substantial proportion of the variance in exercise adherence, indicating that these factors are meaningful predictors of long-term exercise behavior. Nevertheless, approximately 38.8% of the variance remains unexplained, suggesting that other factors may also influence exercise adherence. Variables such as environmental conditions, access to exercise facilities, perceived health status, mental well-being, lifestyle habits, and socioeconomic characteristics may be considered in future studies.

The findings have several practical implications for health promotion and public policy in Vietnam. First, healthcare organizations and fitness professionals should develop interventions that enhance exercise self-efficacy through goal-setting, skill development, behavioral coaching, and positive reinforcement. Second, health communication campaigns should emphasize the long-term health benefits of regular physical activity and encourage individuals to adopt preventive health behaviors. Third, policymakers should support the adoption of digital health technologies and promote digital literacy among middle-aged adults to maximize the benefits of technology-assisted health management. Finally, community organizations should create supportive social environments that encourage collective participation in physical activity.

Despite its contributions, this study has several limitations. The use of convenience sampling may limit the generalizability of the findings to the broader Vietnamese population. In addition, the cross-sectional research design prevents the establishment of causal relationships. Self-reported measures may also be subject to response bias. Future research may employ longitudinal designs, larger and more diverse samples, and additional explanatory variables to further investigate exercise adherence among middle-aged adults.

Overall, the findings suggest that exercise adherence among middle-aged adults in Vietnam is influenced by a

combination of psychological, social, and technological factors. Among these determinants, exercise self-efficacy plays the most important role, followed by health motivation, digital health technology use, and social support. Understanding these factors can assist policymakers, healthcare professionals, and fitness organizations in developing effective strategies to promote lifelong physical activity and support healthy aging in Vietnam.

Conclusion

This study investigated the determinants of exercise adherence among middle-aged adults in Vietnam by examining the roles of health motivation, social support, exercise self-efficacy, and digital health technology use. The findings revealed that all four factors significantly and positively influence exercise adherence, providing empirical evidence for understanding long-term exercise behavior among middle-aged adults.

Among the examined determinants, exercise self-efficacy was identified as the strongest predictor of exercise adherence. Individuals with greater confidence in their ability to maintain exercise routines were more likely to sustain regular participation in physical activity. Health motivation also demonstrated a significant positive influence, indicating that concerns regarding health improvement, disease prevention, and healthy aging encourage individuals to maintain exercise habits. In addition, the use of digital health technologies, including fitness applications and wearable devices, positively contributed to exercise adherence by facilitating self-monitoring, goal setting, and behavioral management. Social support from family, friends, and community networks was also found to play an important role in encouraging continued participation in exercise activities.

The study further demonstrated that the proposed research model possesses substantial explanatory power, highlighting the combined influence of psychological, social, and technological factors on exercise adherence. These findings contribute to the literature on physical activity behavior and provide valuable insights into the promotion of healthy lifestyles among middle-aged adults in Vietnam.

From a practical perspective, policymakers, healthcare professionals, fitness organizations, and community health programs should develop comprehensive strategies that strengthen exercise self-efficacy, enhance health motivation, encourage social support, and promote the adoption of digital health technologies. Such efforts may increase long-term exercise participation and contribute to healthier aging populations.

Despite its contributions, the study is limited by its cross-sectional design and the use of convenience sampling. Future research should employ longitudinal approaches, include more diverse populations, and examine additional determinants of exercise adherence. Nevertheless, the findings highlight the importance of multiple interrelated factors in supporting sustained physical activity and offer practical recommendations for promoting active lifestyles among middle-aged adults in Vietnam.

Acknowledgments

The author would like to express sincere appreciation to the University of Finance – Marketing, Vietnam, for supporting this research. The author also gratefully acknowledges all students, lecturers, and educational administrators who participated in the study and contributed valuable information. Special thanks are extended to the anonymous reviewers and editorial board members for their constructive comments and suggestions that helped improve the quality of this manuscript.

References

1. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes,1991:50(2):179–211.
2. Bandura A. Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ: Prentice Hall, 1986.
3. Bandura A. Self-Efficacy: The Exercise of Control. New York: Freeman, 1997.
4. Biddle SJH, Mutrie N, Gorely T. Psychology of Physical Activity: Determinants, Well-Being and Interventions (4th ed.). Routledge, 2021.
5. Bull FC, Al-Ansari SS, Biddle SJH, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. British Journal of Sports Medicine,2020:54(24):1451–1462.
6. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Physical activity, exercise adherence, and healthy aging: Current evidence and future directions. Journal of Sport and Health Science,2022:11(2):135–146.
7. Deci EL, Ryan RM. Self-determination theory: Basic psychological needs in motivation, development, and wellness. Contemporary Educational Psychology,2020:61:101860.
8. Dishman RK, Heath GW, Lee IM. Physical Activity Epidemiology (3rd ed.). Human Kinetics, 2021.
9. Ekkekakis P, Zenko Z, Ladwig MA. Why do people exercise and why do they stop? Understanding exercise adherence from a behavioral perspective. Current Opinion in Psychology,2021:42:1–6.
10. Estabrooks PA, Harden SM, Burke SM. Group dynamics and social support in exercise behavior. Health Psychology Review,2022:16(1):67–84.
11. Goodyear VA, Kerner C, Quennerstedt M. Young people, digital technologies, and health-related behaviors. Sport, Education and Society,2021:26(9):967–981.
12. Kwan BM, Stevens CJ, Bryan AD. What drives exercise adherence? A review of motivational factors influencing physical activity. Annals of Behavioral Medicine,2020:54(8):548–560.
13. Lee J, Kim H, Park S. Determinants of exercise adherence among middle-aged adults: Evidence from community health programs. BMC Public Health,2023:23(1):1245.
14. Marcus BH, Williams DM, Dubbert PM, et al. Physical activity intervention studies: Understanding long-term adherence. American Journal of Preventive Medicine,2021:60(3):111–120.
15. OECD. Health at a Glance 2023: OECD Indicators. Paris: OECD Publishing, 2023.
16. Rhodes RE, Janssen I. Predicting exercise adherence and physical activity maintenance: A systematic review. Health Psychology Review,2022:16(4):465–486.
17. Ryan RM, Deci EL. Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions.

Contemporary Educational Psychology,2020:61:101860.
18. Smith GL, Banting L, Eime R, O'Sullivan G, van Uffelen JGZ. The association between social support and physical activity participation among adults: A systematic review. International Review of Sport and Exercise Psychology,2021:14(1):50–76.
19. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. MIS Quarterly,2003:27(3):425–478.
20. Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Dong J, Fabian N, et al. Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research,2021:122:889–901.
21. Wang J, Xu Y, Liu H. The role of wearable technologies in promoting exercise adherence among adults. International Journal of Environmental Research and Public Health,2023:20(5):4218.
22. World Health Organization. World Mental Health Report: Transforming Mental Health for All. Geneva: WHO, 2022.
23. World Health Organization. Global Status Report on Physical Activity 2024. Geneva: WHO, 2024.
24. Zhang Y, Li C, Wang X. Digital health technology use and physical activity behavior among middle-aged adults. Sustainability,2023:15(11):8745.
25. Zhao L, Chen S, Huang Y. Self-efficacy, motivation, and exercise adherence among adults: Evidence from a structural equation modeling approach. Frontiers in Public Health,2024:12:1358742.