

INPLASY2025100105
doi: 10.37766/inplasy2025.10.0105
Received: 26 October 2025
Published: 26 October 2025

Zhu, JH.

Corresponding author:
Junhong ZHU

1307133789@qq.com

Author Affiliation:
Chengdu University.

ADMINISTRATIVE INFORMATION

Support - Self-funded.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2025100105

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 26 October 2025 and was last updated on 26 October 2025.

INTRODUCTION

Review question / Objective Systematically evaluate the effectiveness of exercise interventions for adolescent internet addiction and further clarify potential moderating factors.

Condition being studied With the rapid advancement of internet technology and the widespread adoption of smart devices, adolescent internet addiction has emerged as a global public health issue. Although existing research has explored the feasibility of physical exercise as an intervention for internet addiction, significant heterogeneity exists in intervention design and methodological quality. Particularly, insufficient analysis of key moderating factors—such as exercise modality, intensity, and duration—has resulted in unclear evidence regarding the effectiveness of physical exercise in treating adolescent internet addiction.

METHODS

Search strategy
Pubmed
((((("Internet Addiction Disorder"[Mesh]) OR (Addiction Disorder, Internet[Title/Abstract] OR Disorder, Internet Addiction[Title/Abstract] OR Internet Addiction Disorders[Title/Abstract] OR Internet Addiction[Title/Abstract] OR Addiction, Internet[Title/Abstract] OR Internet Addictions[Title/Abstract] OR Internet Gaming Disorder[Title/Abstract] OR Disorders, Internet GamingGaming Disorders, Internet[Title/Abstract] OR Internet Gaming Disorders[Title/Abstract] OR Smartphone Addiction[Title/Abstract] OR Addiction, Smartphone[Title/Abstract] OR Addictions, Smartphone[Title/Abstract] OR Smartphone Addictions[Title/Abstract] OR Social Media Addiction[Title/Abstract] OR Addiction, Social MediaMedia Addictions, Social[Title/Abstract] OR Social Media Addictions[Title/Abstract]))) AND (((("Exercise"[Mesh]) OR (Exercises[Title/Abstract] OR Physical Exercise[Title/Abstract] OR Physical

Exercises[Title/Abstract] OR Exercise, Aerobic[Title/Abstract] OR Aerobic Exercise[Title/Abstract] OR Aerobic Exercises[Title/Abstract] OR Exercises, Aerobic[Title/Abstract] OR Exercise, Isometric[Title/Abstract] OR Exercises, Isometric[Title/Abstract] OR Isometric Exercises[Title/Abstract] OR Isometric Exercise[Title/Abstract] OR Acute Exercise[Title/Abstract] OR Acute Exercises[Title/Abstract] OR Exercise, Acute[Title/Abstract] OR Exercises, Acute[Title/Abstract] OR Exercise Training[Title/Abstract] OR Exercise Trainings[Title/Abstract] OR Training, Exercise[Title/Abstract] OR Trainings, Exercise[Title/Abstract] OR Physical Activity[Title/Abstract] OR Activities, Physical[Title/Abstract] OR Activity, Physical[Title/Abstract] OR Physical Activities[Title/Abstract])))) AND (("Adolescent"[Mesh]) OR (Adolescents[Title/Abstract] OR Adolescence[Title/Abstract] OR Youth[Title/Abstract] OR Youths[Title/Abstract] OR Teens[Title/Abstract] OR Teen[Title/Abstract] OR Teenagers[Title/Abstract] OR Teenager[Title/Abstract]))

EMBASE

('adolescents'/exp OR 'adolescence':ti,ab OR 'youth':ti,ab OR 'youths':ti,ab OR 'teens':ti,ab OR 'teen':ti,ab OR 'teenagers':ti,ab OR 'teenager':ti,ab) AND ('exercise'/exp OR 'physical exercise':ti,ab OR 'physical exercises':ti,ab OR 'exercise, aerobic':ti,ab OR 'aerobic exercise':ti,ab OR 'aerobic exercises':ti,ab OR 'orexercises, aerobic':ti,ab OR 'exercise, isometric':ti,ab OR 'exercises, isometric':ti,ab OR 'isometric exercises':ti,ab OR 'isometric exercise':ti,ab OR 'acute exercise':ti,ab OR 'acute exercises':ti,ab OR 'exercise, acute':ti,ab OR 'exercises, acute':ti,ab OR 'exercise training':ti,ab OR 'exercise trainings':ti,ab OR 'training, exercise':ti,ab OR 'trainings, exercise':ti,ab OR 'physical activity':ti,ab OR 'activities, physical':ti,ab OR 'activity, physical':ti,ab OR 'physical activities':ti,ab) AND ('internet addiction'/exp OR 'addiction disorder, internet':ti,ab OR 'disorder, internet addiction':ti,ab OR 'internet addiction disorders':ti,ab OR 'internet addiction':ti,ab OR 'addiction, internet':ti,ab OR 'internet addictions':ti,ab OR 'internet gaming disorder':ti,ab OR 'disorders, internet gaming':ti,ab OR 'gaming disorders, internet':ti,ab OR 'internet gaming disorders':ti,ab OR 'smartphone addiction':ti,ab OR 'addiction,smartphone':ti,ab OR 'addictions,smartphone':ti,ab OR 'smartphone addictions':ti,ab OR 'social media addiction':ti,ab OR 'addiction, social media':ti,ab OR 'media addictions, social':ti,ab OR 'social media addictions':ti,ab)

WOS

#1 TS=Exercises OR "Physical Exercise" OR "Physical Exercises" OR "Exercise, Aerobic" OR "Aerobic Exercise" OR "Aerobic Exercises" OR "Exercises, Aerobic" OR "Exercise, Isometric" OR "Exercises, Isometric" OR "Isometric Exercises" OR "Isometric Exercise" OR "Acute Exercise" OR "Acute Exercises" OR "Exercise, Acute" OR "Exercises, Acute" OR "Exercise Training" OR "Exercise Trainings" OR "Training, Exercise" OR "Trainings, Exercise" OR "Physical Activity" OR "Activities, Physical" OR "Activity, Physical" OR "Physical Activities"

#2 TS=Adolescents OR Adolescence OR Youth OR Youths OR Teens OR Teen OR Teenagers OR Teenager

#3 TS="Addiction Disorder, Internet" OR "Disorder, Internet Addiction" OR "Internet Addiction Disorders" OR "Internet Addiction" OR "Addiction, Internet" OR "Internet Addictions" OR "Internet Gaming Disorder" OR "Disorders, Internet Gaming" OR "Gaming Disorders, Internet" OR "Internet Gaming Disorders" OR "Smartphone Addiction" OR "Addiction,Smartphone" OR "Addictions,Smartphone" OR "Smartphone Addictions" OR "Social Media Addiction" OR "Addiction, Social Media" OR "Media Addictions, Social" OR "Social Media Addictions"

#4 TS=#1 AND #2 AND #3

cochrane

#1 MeSH descriptor: [Internet Addiction Disorder] explode all trees

#2 ("Addiction Disorder, Internet" OR "Disorder, Internet Addiction" OR "Internet Addiction Disorders" OR "Internet Addiction" OR "Addiction, Internet" OR "Internet Addictions" OR "Internet Gaming Disorder" OR "Disorders, Internet Gaming" OR "Gaming Disorders, Internet" OR "Internet Gaming Disorders" OR "Smartphone Addiction" OR "Addiction,Smartphone" OR "Addictions,Smartphone" OR "Smartphone Addictions" OR "Social Media Addiction" OR "Addiction, Social Media" OR "Media Addictions, Social" OR "Social Media Addictions"):ti,ab,kw

#3 MeSH descriptor: [Exercise] explode all trees

#4 MeSH descriptor: [Adolescent] explode all trees

#5 (Adolescents OR Adolescence OR Youth OR Youths OR Teens OR Teen OR Teenagers OR Teenager):ti,ab,kw

#6 #1 OR #2

#7 (Exercises OR "Physical Exercise" OR "Physical Exercises" OR "Exercise, Aerobic" OR "Aerobic Exercise" OR "Aerobic Exercises" OR "Exercises, Aerobic" OR "Exercise, Isometric" OR "Exercises, Isometric" OR "Isometric Exercises" OR "Isometric Exercise" OR "Acute Exercise" OR "Acute Exercises" OR "Exercise, Acute" OR

“Exercises, Acute” OR “Exercise Training” OR “Exercise Trainings” OR “Training, Exercise” OR “Trainings, Exercise” OR “Physical Activity” OR “Activities, Physical” OR “Activity, Physical” OR “Physical Activities”):ti,ab,kw

#8 #3 OR #7

#9 #4 OR #5

#10 #6 AND #8 AND #9

CNKI

#1 Internet Addiction + Internet Addiction Disorder + Internet Abuse/Excessive Internet Use + Pathological Internet Use + Internet Obsession

#2 Exercise + Physical Activity + Anaerobic Exercise + Aerobic Exercise + Physical Activity

#3 Adolescents.

Participant or population Teenagers with Internet Addiction.

Intervention The experimental group implemented any planned and organized physical activity intervention.

Comparator The control group received no intervention, routine education, or other non-exercise forms of active intervention.

Study designs to be included Randomized controlled trials or comparative studies involving at least two groups.

Eligibility criteria Exclusion Criteria: (1) Participants clinically diagnosed with other severe psychiatric disorders requiring medication or co-occurring substance use disorders. (2) Single-group pre-post studies, cross-sectional studies, reviews, systematic reviews, conference abstracts, and case reports. (3) Studies with missing or incomplete data reporting. (4) Non-English or non-Chinese language publications. (5) Animal studies.

Information sources Searches were conducted in PubMed, Web of Science, Embase, Cochrane Library, and CNKI databases, with the search date cutoff set to September 2, 2025.

Main outcome(s) Twelve studies with a total sample size of 553 participants were included. Very low-quality evidence indicates that exercise can improve adolescent internet addiction ($g = -1.61$, 95% CI $[-2.12, -1.10]$, $P < 0.01$). Exercise modality was a moderating factor (Q , $P = 7.95$, 0.005). Mixed exercise yielded the strongest effect: $g = -2.51$, 95% CI $[-3.20, -1.82]$, $P = 0.05$). No publication bias was detected ($t = 0.17$, $P > |t| = 0.87 > 0.05$).

Quality assessment / Risk of bias analysis All 11 included studies reported “acceptance criteria” and “point measurements and variability measurements”; 11 studies performed “between-group comparisons,” 11 reported “baseline similarity,” and 7 achieved “random assignment.” One study implemented “subject blinding.” One study (Taewoon 2025) reported the use of ITT analysis. Methodological quality assessment total scores: 3 points (3 studies), 4 points (1 study), 5 points (4 studies), 6 points (3 studies), with an average score of approximately 4.5 points..

Strategy of data synthesis A total of 12 studies were included, with $g = -1.45$, 95% CI: $[-2.01, -0.89]$, $P < 0.01$. The difference was statistically significant, indicating that physical exercise interventions can significantly reduce levels of internet addiction. The heterogeneity test yielded an I^2 value of 88.07% ($P < 0.01$), indicating substantial heterogeneity among the included studies. Therefore, a random-effects model was selected for data synthesis. After excluding one study [17] and pooling the effect sizes, the pooled g -value was -1.61 , with a 95% confidence interval of $[-2.12, -1.10]$. $P < 0.01$ indicates that physical exercise can improve adolescent internet addiction.

Subgroup analysis Subgroup Analysis

Subgroup analysis results indicate (Table 3) that intervention modality modulates intervention effectiveness ($Q = 7.95$, $P = 0.00$). In the meta-analysis, intervention modalities were categorized into two types: the effect size for combined exercise was $g = -2.51$, 95% CI: $[-3.20, -1.82]$, $p < 0.01$. The effect size for non-combined exercise was $g = -1.29$, 95% CI: $[-1.78, -0.79]$, both statistically significant.

Subgroup analysis by intervention intensity revealed that intervention intensity did not modulate the effect ($Q = 4.81$, $P = 0.09$). The effect size for dynamically adjusted intensity was $g = -1.38$, 95% CI: $[-2.63, -0.13]$, $p = 0.03$; for fixed moderate intensity, $g = -2.04$, 95% CI: $[-2.82, -1.26]$, $p < 0.01$; The effect size for intensity not explicitly quantified was $g = -1.04$, 95% CI: $[-1.48, -0.59]$, $p < 0.01$. All intensity groups demonstrated significant intervention effects.

Subgroup analysis by intervention duration revealed that intervention duration did not modulate the intervention effect ($Q = 1.45$, $P = 0.48$). The effect size for the ≥ 90 min group was $g = -1.46$, 95% CI: $[-2.14, -0.77]$, $p < 0.01$; for the < 90 min group, $g = -1.84$, 95% CI: $[-2.71, -0.96]$, $p < 0.01$; The effect size for the unspecified duration group was $g = -1.14$, 95% CI: $[-1.86, -0.43]$, $p =$

0.01. All duration groups demonstrated significant intervention effects.

Subgroup analysis by intervention frequency revealed no moderating effect of frequency on intervention outcomes ($Q = 1.36$, $P = 0.51$). The effect size for the ≥ 3 times/week group was $g = -1.64$, 95% CI: $[-2.39, -0.88]$, $p < 0.01$; for the < 3 times/week group, $g = -1.83$, 95% CI: $[-3.01, -0.66]$, $p < 0.01$; The effect size for the unspecified frequency group was $g = -1.14$, 95% CI: $[-1.86, -0.43]$, $p < 0.01$. All frequency groups demonstrated significant intervention effects.

Subgroup analysis by intervention duration revealed no moderating effect of duration on outcomes ($Q = 1.20$, $P = 0.27$). The effect size for the ≥ 12 -week group was $g = -1.96$, 95% CI: $[-2.71, -1.20]$, $p < 0.01$; The effect size for the < 12 -week group was $g = -1.39$, 95% CI: $[-2.07, -0.72]$, $p < 0.01$. All intervention duration groups demonstrated significant effects.

Study design did not moderate intervention effects ($Q = 0.08$, $P = 0.78$). The effect size for RCT studies was $g = -1.55$, 95% CI: $[-2.12, -0.98]$, $p < 0.01$; for non-RCT studies.

Sensitivity analysis The sensitivity plot indicates that one study [17] falls outside the 95% confidence interval, suggesting high heterogeneity may be attributable to this study. After excluding study [17] and pooling the effect sizes, the pooled effect size was $g = -1.61$, 95% CI: $[-2.12, -1.10]$. $P < 0.01$, indicating that physical exercise can improve adolescent internet addiction.

Country(ies) involved China.

Keywords Keywords: Sports Intervention, Internet Addiction, Adolescents, Systematic Review, Meta-Analysis, Exercise, Behavioral Addiction, Youth.

Contributions of each author

Author 1 - Junhong ZHU.

Email: 1307133789@qq.com