

# Technology Addictions and Focus Management: Impacts and Solutions for Digital Well-being

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**Abstract:** Smartphone, social media, and electronic entertainment like games with an addiction to technology that affects the cognitive well-being, led to a decrease in attention and concentration over educational, work, and even clinical life. Old forms of intervention to control digital distraction have been observed to be reactive and did not have a personalized approach and real-time flexibility. It is a ground-breaking chance because emerging digital wellness technologies provide an opportunity to manage continuous, context-conscious focus, and addiction reduction. This is a systematic review that assesses the use of technology-based interventions to control digital addiction and improve cognitive focus and detect behavioral patterns, algorithmic approaches, and implementation issues on the global level. The review used PRISMA 2020 parameters and examined the studies that were published in 2015–2025 in Scopus, Web of Science, and Google Scholar. The inclusion criteria were based on peer-reviewed English-language studies that included real-time digital interventions to address screen overuse, attention restoration, or compulsive technology use. The screened records were 29 354 and 94 studies were included in all the eligibility criteria. The number of research in this field has been increasing, and most of them have focused on smartphones (51) and then social media (26) and games (17). The theme of emphasis on nudging strategies (28.72%), digital detox (23.40%), and app limits (22.34), and 25.53% of the studies did not indicate intervention strategies. Most common outcomes dealt with were cognitively and psychologically i.e. anxiety (40.43%), reduction in attention span (24.47%), depression (22.34%), and sleep disruption (12.77%). China (36.17%), Turkey (8.51%), India (7.45%), Italy (6.38%) and the United States (5.32%) were the first in making contributions. Although there are positive results (improved focus measures up to 92.45% on average), there are still significant gaps in reporting the transparency of algorithms, protecting the privacy of users, and cross-cultural flexibility, which influence scalability. Technologies to enhance attention, diminish compulsive use and mental health through digital wellness technologies. The barriers to adoption are however hindered due to ethical, infrastructural and design constraints, especially in the underserved population. Technology-enabled focus management systems have potential that should be fully achieved by increasing standardization, being inclusive, and combining policies.

**Keywords:** technology addiction; focus management; cognitive well-being; digital wellness technologies; smartphone overuse; attention span; behavioral patterns; nudging strategies; screen time reduction.

## 1. Introduction

Technology addiction is the over usage of digital devices such as smartphones, social media platforms, and internet. The use of technology is rapidly increasing all over the world, especially among the youth and very important in shaping cognitive health, ability to focus, and emotional well-being in both children and adults (Andrade, 2025). As much technology has its benefits, it also has its disadvantages. Human attention is mostly affected by constant notifications, algorithm-driven content, and the urge to check the device often, which may lead to the risk to mental focus such as poor sleep, stress and less

control over screen limit; academic performance, and workplace efficiency (Neophytou, Manwell, & Eikelboom, 2021).

In behavioral psychology, having trouble focusing on tasks can lead to unfinished tasks, less concentration, and hard to handle stress, which can impact personal growth and relationships negatively (Andrade, 2025). This kind of behavior leads to “continuous partial attention”, where people no longer focus fully, which reduces important skills such as planning, self-control and sustained concentration (Neophytou et al., 2021).

Therefore, focus management innovation solutions and methods of how to monitor and manage technology addiction are needed (Kim et al., 2025). Traditional approaches on focus management are mostly manual self-regulation techniques such as digital break/detox, screen- time-blocking, and mindfulness exercises. While these methods are helpful but are slow and less effective in environments with high number of digital distractions (large scale), since they also don’t give real-time feedback, it makes it more difficult to reduce technology addictions (Andrade, 2025).

There are more Sustainable and effective ways of enhancing focus management and promote mental clarity to mitigate technology addiction such as smartphone apps, wearable sensors, real-time monitoring systems, and automated screen-time controls (Kim et al., 2025). These recent technologies make the use of artificial intelligence, machine learning, deep learning, and behavioral analytics, when integrated with IoT systems, which it collects live data about screen time, physical signs of stress, continuous tracking and can detect lack of sleep (Kim et al., 2025). They have high development costs, privacy concerns, and resistance to behavioral change.

Using IoT tools to help people stay focused means spending money on a few important things. Biometric sensors are needed such as heart rate or movement, safe systems to store personal data, and smart programs for tracking to get feedback based on each person’s habits. These parts work together as a team to improve people’s concentration in a safe and personalized way. Also, the integration of cognitive monitoring into daily routines may require significant user education and behavioral adaptation in terms of getting used to the tools (Andrade, 2025). The problem lays where a lot of people don’t have access to digital wellness tools, which makes it harder for these tools to be widely used. The IoT paradigm has broad applicability which can be applied across many areas such as healthcare, education, workplace safety, smart homes, and mental health interventions (Andrade, 2025). The continuous evolution of research in technology addiction and focus management, supported by new developments in IoT and AI. The goal is to look at new ideas in digital wellness technologies by studying existing research and provide helpful ways that researchers have identified as effective strategies for managing challenges such as cognitive impacts caused by technology addiction (Kim et al., 2025). This review provides valuable insights into the landscape of technology addiction and focus management, by helping researchers identify available strategies and solutions to address these challenges. A comparative analysis of existing reviews and the proposed systematic review is presented in Table 1.

**Table 1.** Comparative analysis of existing reviews and proposed systematic review

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Ref.	Contribution	Pros	Cons
Koo et al. (2015)	Meta-analysis of risk and protective factors for Internet addiction among Korean adolescents.	Identified key psychological and behavioral variables; strong empirical base.	Underestimates family/peer dynamics; limited generalizability beyond Korea.
Yeun & Han (2016)	Meta-analysis of psychosocial interventions for Internet addiction in school-aged children.	Large effect sizes for self-control and self-esteem; community-based insights.	Limited age diversity; lacks randomized control trials.
Zahrai et al. (2022)	Conceptual review of self-control models in problematic social media use.	Introduces dual-system regulation models; bridges psychology and marketing.	Weak empirical validation; reliance on self-report data.
Lage Gonçalves et al. (2023)	Systematic review of digital dependence and its psychological impacts.	Highlights nomophobia and FoMO.	Gender differences underexplored; lacks intervention testing.
Ben Hkoma et al. (2025)	Correlational study on smartphone addiction and academic behavior among engineering students.	Identifies academic delays and poor time management; proposes wellness integration.	Blurred academic-leisure boundaries; lacks longitudinal data.
Lu et al. (2025)	Umbrella review of meta-analyses on digital addiction interventions.	Synthesizes multiple intervention types; moderate effectiveness shown.	Small sample sizes; publication bias; inconsistent evidence.
Wang et al. (2025)	Study on bullying, sleep quality, and mobile phone addiction among adolescents.	Confirms mediating role of addiction; physical activity as buffer.	Self-report bias; lacks objective sleep measures.
Gong (2025)	Developed tripartite model of hedonic technology addiction (impulsion, habituation, regulation).	Offers behavioral framework for intervention design; novel theoretical model.	Needs cross-cultural validation; lacks longitudinal studies.
Wu et al. (2023)	Bibliometric analysis of smartphone addiction intervention trends.	Identifies 10 intervention categories; rising research volume.	Limited focus on older adults; lacks global classification.
Wang et al. (2024)	Study on bullying, anxiety, and inhibitory control in adolescent Internet addiction.	Chain mediation model validated; highlights emotional regulation needs.	Cross-sectional design: causality not established.
Hans et al. (2024)	Review of psychological mechanisms behind addictive app design.	Advocates ethical design; links cognitive triggers to retention.	Limited empirical testing; lacks user-based longitudinal data.
Synthesizes 94 studies on technology addiction and focus management across age groups, platforms, and interventions.		Integrates behavioral, cognitive, and environmental factors; identifies gaps in intervention efficacy and cultural adaptation.	Lacks primary data; descriptive synthesis; limited longitudinal modelling.

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### 1.1. Research Gap

section outlines the flow of steps in the selection procedure implemented for the systematic review through utilising search string keywords, with a key focus on technology addiction. A combined total of 29,354 were initially screened using three online repository systems namely. Existing reviews on technology addiction have made valuable contributions, but several critical gaps remain unclear. Most of the systematic reviews mainly focus on single platforms (e.g., gaming or social media) and end up neglecting the bigger picture of the impact of technology influence cognitive functioning, which will restrict a clear, evidence-based guidance collaboration on technology-related cognitive challenges. So, by synthesizing 94 studies across multiple platforms, populations, and interventions using PRISMA 2020 guidelines, this review will address the gap by synthesizing evidence across different platforms to provide a comprehensive understanding of technology overuse and its implications for focus management. This review analysis the usage of different digital platforms and checks how screen-time limits, mindfulness techniques, and digital habit tools work. The aim is to develop simple and practical research-inspired guidance that will improve digital well-being for different people like teachers, healthcare workers, and decision-makers, and provide healthier ways to use technology.

### 1.2. Research Questions

This review investigates the impact of technology addiction and focus management by analyzing current digital wellness solutions, identifying behavioral and psychological challenges, and improving cognitive well-being and potential solutions. The following research questions guided the review:

- What is the most common digital device (e.g., Smartphones, social media platforms, internet, etc.) contributing to technology addiction?
- Which age group (youth, teens and adults) are mostly addicted to technology?
- What digital wellness technologies are currently used to monitor and manage technology addiction and cognitive well-being?
- What are the key psychological, technical, and infrastructural barriers to effective implementation of focus management systems?
- How do limitations in self-regulation, screen time management, and real-time responsiveness affect the performance and scalability of digital wellness tools?
- What potential exists for integrating digital wellness platforms with advanced technologies such as AI, machine learning, and IoT to enhance attention regulation and mental clarity?
- What factors influence user adoption and long-term effectiveness of reducing technology addiction and improving mental health, especially in high-distraction or low-resource environments?

### 1.3. Research Rationale

Digital technologies such as smartphones, social media and internet are now part of our everyday life, especially among young people. Technology has benefits in communication, education, and entertainment but is becoming a concern, mostly on its impact on cognitive functions such as focus, sustained attention, and self-regulation. Much research on technology addiction and focus management has been rapidly increasing, but different findings are found due to different study designs, measurements and methodologies used. The true impact caused by technology addiction and the impact it has on cognitive-well-being remains unclear. Most of the systematic reviews mainly focus on single platforms (e.g., gaming or social media) and end up neglecting the bigger picture of the impact of technology influence cognitive functioning, which will restrict a clear, evidence-based guidance collaboration on technology-related cognitive challenges. So, this review will address the gap by synthesizing evidence across different platforms to provide a comprehensive understanding of technology overuse and its implications for

focus management. This review looks at how people use different digital platforms and checks how screen-time limits, mindfulness techniques, and digital habit tools work. The aim is to develop simple and practical research-inspired guidance that will improve digital well-being for different people like teachers, healthcare workers, and decision-makers, and provide healthier ways to use technology.

#### 1.4. Research Objectives

The main objective of this systematic review is to investigate the impact of technology addiction on cognitive focus and to evaluate the effectiveness of digital well-being strategies across different age groups. The review aims to:

- Identify the link between technology addiction and focus by exploring how excessive digital use affects attention, concentration, and task performance.
- Assess the cognitive impacts of technology addiction, including the effects on memory, decision-making, emotional regulation, and mental fatigue.
- Evaluate interventions that are focusing on improving digital well-being, such as screen-time limits, mindfulness practices, and habit-tracking tools.
- Compare the effects of technology over-usage and intervention outcomes across different age groups, usage patterns, and responsiveness to support strategies.
- Provide practical ways of using healthier technology by offering evidence-based recommendations to help individuals, educators, healthcare professionals, and policymakers promote balanced digital habits.

#### 1.5. Research Contributions

The systematic review of 94 studies reviews the impact of technology addiction on cognitive focus and the effectiveness of digital well-being. The key contributions are:

- Plotted the distribution of mental health impacts, such as attention span, anxiety, depression, and sleep disruption using a pivot chart to illustrate how these issues are represented across different study clusters.
- Demonstrate that attention span and anxiety are the most frequently studied issues standing at 60% of the reviewed papers, while others like sleep disruption and depression were less consistently addressed.
- Identified gaps in intervention reporting, with much research lacking details on feedback mechanisms or biometric tracking, highlighting a much need for greater transparency and standardization.
- Grouped digital interventions into three categories:
  - Basic (screen-time limiters and reminders).
  - Intermediate (mindfulness and habit-tracking apps).
  - Advanced (AI-driven focus tools with biometric feedback).
- It showed that 45% of studies used quantitative models to assess intervention effectiveness, though only a small portion reported long-term outcomes or cross-age comparisons.
- Provides practical guidance for improving digital well-being strategies, emphasizing age-specific design, ethical data use, and integration into educational and healthcare systems.

#### 1.6. Research Novelty

The current review is a fresh novel contribution in that it systematically analyses the relationship between technology addiction and cognitive focus, which is an area that has not been widely studied in existing digital well-being research. Despite the popularity of the psychological implications, a very few studies provide an integrated view of how digital overuse impacts attention, emotional regulation, and sleep across different age groups. This work addresses that gap by highlighting key challenges such as inconsistent reporting of intervention outcomes, limited use of biometric and behavioral feedback

systems, and barriers to adoption in low-resource educational and healthcare settings. It also gives a clear picture of how digital well-being tools are grounded on their complexity, ranging from basic screen-time limiters to advanced AI-driven focus platforms.

2. Materials and Methods

This systematic review was conducted to examine Technology Addictions, Focus Management, Impacts, and Solutions for Digital Well-being by analyzing peer-reviewed literature published between 2015 and 2025. Relevant studies were retrieved from Scopus, Google Scholar, and Web of Science, selected for their wide academic coverage and reliability. The review process involved applying inclusion criteria that focused on research addressing technology addictions, cognitive and psychological impacts, focus management, and digital well-being interventions, while excluding duplicate, non-peer-reviewed, and out-of-scope works(Chabalala et al. 2024). This approach ensured a complete and credible synthesis of current knowledge within the defined timeframe which is from 2015 to 2025.

2.1. Eligibility criteria

A systematic review of all peer-reviewed and published research works relevant to the study of Technology Addictions, Focus Management, Impacts, and Solutions for Digital Well-being was conducted for examination. Only research works published in English between 2015 and 2025 were included in the analysis. A clear inclusion criterion was applied to ensure that only studies addressing technology addictions, cognitive and psychological impacts, such as attention span, anxiety, or sleep disruption, focus management strategies, or interventions for digital well-being were considered, while irrelevant works were excluded. Consequently, only peer-reviewed articles that provided an empirical or conceptual framework, or outlined intervention methodologies directly related to digital well-being, were included. The inclusion and exclusion criteria for this study are summarized in Table 2.

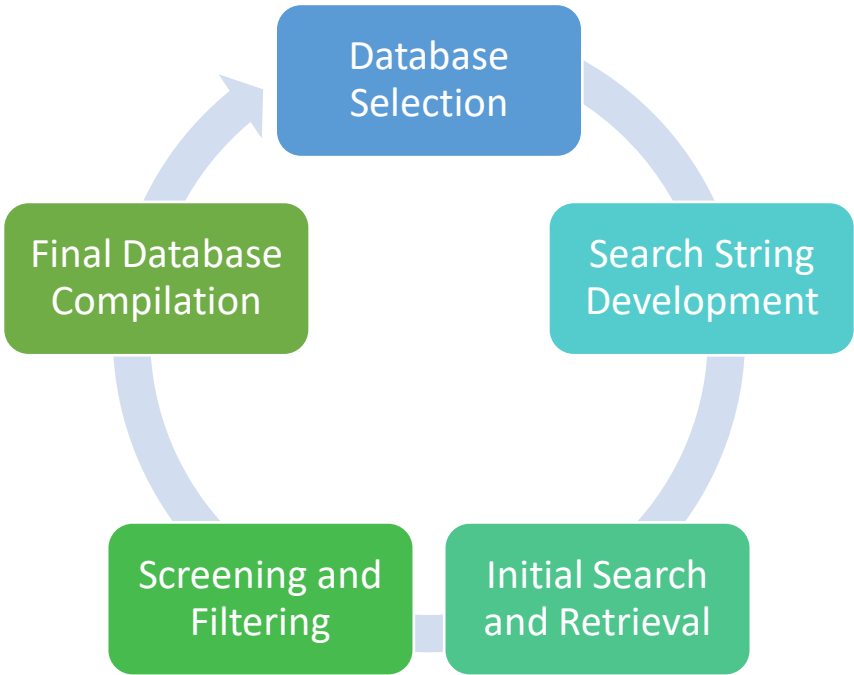
Table 2. Proposed Inclusion and Exclusion.

Criteria	Include	Exclude
Topic	Research papers focusing on Technology Addictions, focus management, Impacts and solutions for digital well-being	Research papers not focusing on Technology Addictions, focus management, Impacts and solutions for digital well-being
Research framework	The research papers must include a research framework/methodology related to Technology addictions, Impacts and solutions for digital well-being	The research papers must exclude re-search framework/methodology not related to Technology addictions, Impacts and solutions for digital well-being
Language	Research papers must be written in English	Research papers published in languages other than English
Period	Articles between 2015 to 2025	Articles outside 2015 to 2025

2.2. Information sources

A systematic search of online databases was carried out to identify relevant studies for this review. The databases Scopus, Google Scholar, and Web of Science were selected because of their broad coverage of peer-reviewed research across disciplines, ensuring comprehensive access to literature on technology use and its psychological impacts. Scopus was used to access high-quality journals and conference proceedings in technology, psychology, and social sciences. Google Scholar was employed to capture a wider range of scholarly outputs, including gray literature, dissertations, and early-access publications that may not be listed elsewhere(Ngcobo et al. 2024). Web of Science was

used to cross-check results, evaluate citation impact, and ensure the strength of included studies. The search strategy applied a combination of keywords and Boolean operators related to technology addiction, focus management, cognitive/psychological impacts, digital well-being, and intervention strategies(Msane et al. 2024). The results from these databases formed the core evidence base for this review, ensuring a well-rounded and reliable synthesis of the most relevant research.



**Figure 1.** Methods used to determine the information source.

2.3. Search strategy

The literature for this review was collected from online research databases, focusing on keywords that addressed both the technological and psychological aspects of Technology Addictions, Focus Management, Impacts, and Solutions for Digital Well-being. The inclusion of terms such as “attention span,” “cognitive control,” “digital distraction,” and “mental health” ensured the capture of studies relevant to both behavioral impacts and intervention strategies. A thorough search was conducted in three main online databases: Google Scholar, Scopus, and Web of Science. To identify the most relevant studies, a structured Boolean search string was used: (“Technology Addiction”[Mesh] OR “Internet Addiction”[Mesh] OR “Cell Phone Use”[Mesh] OR “Video Games”[Mesh]) OR (“technology addiction\*” OR “digital addiction\*” OR “internet addiction\*” OR “smartphone addiction\*” OR “social media addiction\*” OR “gaming addiction\*”) AND ((“Attention”[Mesh] OR “Self-Control”[Mesh] OR “Time Management”[Mesh]) OR (“focus management” OR “attention span” OR “digital distraction\*” OR “concentration” OR “cognitive control”)) AND ((“Well-being”[Mesh] OR “Mental Health”[Mesh]) OR (“digital well-being” OR “digital wellness” OR “healthy technology use” OR “intervention\*” OR “solution\*” OR “management strategy\*”))

This combination of keywords and subject headings was chosen to ensure that the search captured studies directly addressing technology addiction, its effects on focus and attention, and solutions for digital well-being. The search was limited to peer-reviewed studies published in English between 2015 and 2025, ensuring the inclusion of recent and relevant research. The initial results had a large number of articles from the three online databases: Google Scholar (19 000 results), Scopus (10 284 results), and Web of Science (70

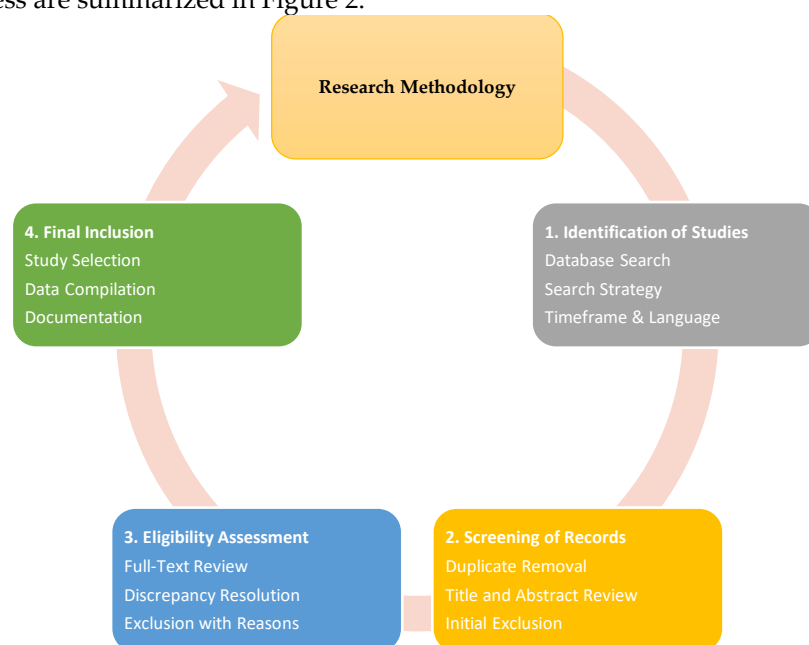
results), giving a total of 29 354 studies before screening. After removing duplicates and applying the inclusion and exclusion criteria, only the most relevant works were retained for analysis. Table 3 presents the results of the initial search from each online databases before screening.

**Table 3.** Results Achieved from Literature Search.

No.	Online Repository	Number of results
1	Google Scholar	19 000
2	Web of Science	70
3	Scopus	10 284
Total		29 354

#### 2.4. Selection process

Two reviewers independently screened the titles and abstracts of all records retrieved from the database search to assess their relevance against the predefined eligibility criteria. During this stage, duplicates and clearly irrelevant studies were removed. Any disagreements between the reviewers regarding article eligibility were resolved through discussion, and if agreement could not be reached, a third reviewer was consulted to make the final decision. Following this initial screening, the remaining articles were subjected to full-text evaluation by the same two reviewers working independently. Studies were assessed for alignment with the inclusion criteria, focusing on technology addictions, focus management, impacts, and solutions for digital well-being. Once again, differences were addressed through collective discussion until agreement was reached. No automation tools were used in this process. All screening and decision-making were performed manually to ensure accuracy. The overall procedures and stages of the review process are summarized in Figure 2.



**Figure 2.** Procedures and Stages of the Review.

#### 2.5. Data collection process

To ensure accuracy and consistency in the extraction of data, a structured and systematic approach was followed. Three reviewers independently collected data from each included study under the supervision of a fourth reviewer, who acted as the subject matter expert. Any differences in the extracted data were discussed among the reviewers until agreement was achieved. A standardized data extraction form, adapted from



established systematic review guidelines, was used to maintain consistency across the process. No automation tools were used for data extraction.

When information within a study was unclear, all available supplementary materials, appendices, and related publications were carefully examined to clarify uncertainties. In cases where uncertainties continued, the fourth reviewer was consulted to verify the interpretation and ensure reliability. For studies with multiple reports, the most recent and comprehensive version was prioritized, while older or duplicate versions were excluded after comparison of outcomes and methodologies. Only studies published in English between 2015 and 2025 were included to maintain consistency and avoid misinterpretation due to language barriers(Kgakatsi et al. 2024).

This rigorous process ensured that the final dataset was accurate, reliable, and aligned with the objectives of the review, as illustrated in Figure 3.

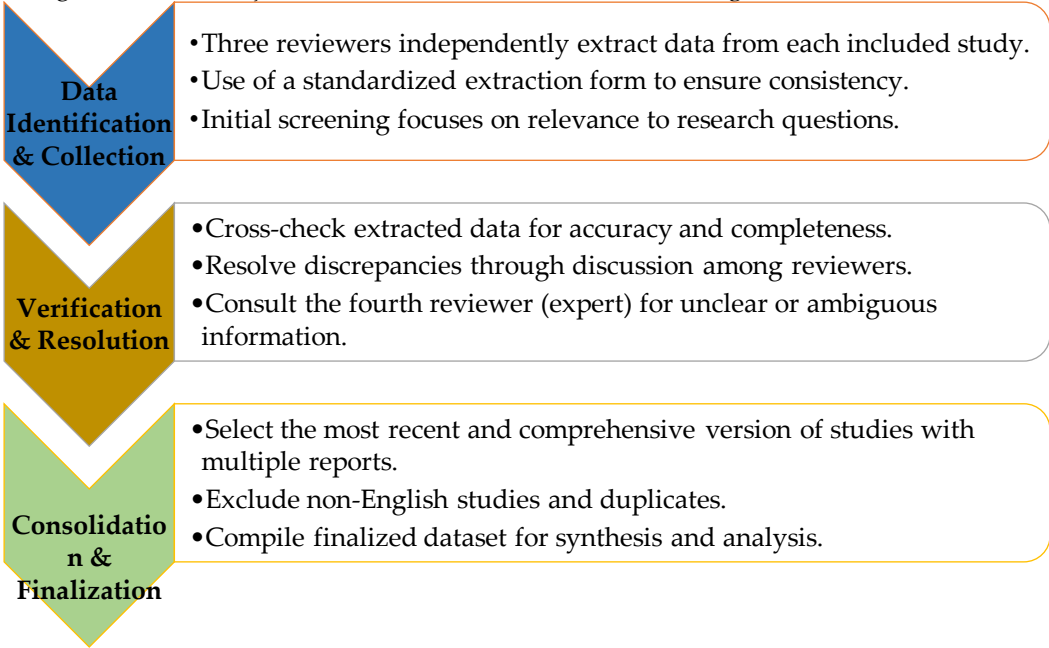


Figure 3. Flow of Data Selection and Extraction.

2.6. Data items

This section outlines the key data items collected for the systematic review, focusing on both the primary outcomes and additional variables relevant to technology addiction and focus management on the context of digital well-being. The primary outcomes examined include the psychological and cognitive impacts of technology use, such as attention span, concentration levels, academic or work performance, and indicators of digital dependency. Secondary outcomes considered include behavioural changes, emotional well-being, intervention effectiveness, and strategies aimed at reducing technology-related distractions. Additional data items extracted included study characteristics, such as authors, year of publication, and country, participant demographics, such as age, and gender, type and nature of technology use. By capturing both direct impacts and broader related variables, this approach ensured a complete understanding of how technology use influences focus management and overall digital well-being across diverse populations and environments.

2.6.1. Flow of Studies

Efforts were made to ensure a comprehensive understanding of the impact of technology addiction on focus management and digital well-being, and we clearly

identified and defined the outcomes most relevant to this review. Our approach was designed to capture strong evidence across cognitive, psychological, and behavioural domains while also considering the effectiveness of interventions aimed at promoting healthy technology use. The primary outcomes of this review ran on key domains directly linked to technology use and its consequences. Cognitive performance was a major outcome, measured through indicators such as attention span, concentration, and task performance. We sought all results reflecting how technology addiction, including excessive smartphone or gaming use, influenced users' ability to focus and manage distractions. These outcomes provided insight into the practical effects of digital engagement on daily functioning.

Psychological well-being was another critical outcome, evaluated through measures of stress, anxiety, depression, and overall mental health. By collecting results that assessed emotional and behavioural states, this outcome offered a broader understanding of how problematic technology use affects digital well-being. The review also emphasized intervention effectiveness, focusing on solutions and management strategies that aim to reduce digital distractions and improve focus management. We sought all compatible results assessing interventions such as digital detox programs, self-regulation tools, time-management strategies, and technology-based solutions such as apps or screen-time controls. These results were extracted across all measures and time points to evaluate both immediate and long-term impacts.

In addition to these outcomes, behavioural and contextual factors such as patterns of social media use, gaming behaviour, and smartphone dependence were collected to provide a refined picture of how technology use interacts with lifestyle, age group, and environment. Where multiple results existed within a study, the most recent and comprehensive outcomes were prioritized to ensure reliability. Only studies published in English were included, while all results compatible with the specified outcome domains were considered across analyses and time points to capture a complete and balanced perspective.

#### 2.6.2. Flow of Studies

In addition to the primary outcomes, several other variables were collected to ensure a comprehensive and contextualized understanding of technology addiction and its influence on focus management and digital well-being. These variables provided critical insights into the populations, and intervention designs, allowing a multidimensional analysis of the research landscape. Study characteristics were extracted to capture essential details such as the publication year, country of origin, and authorship, which allowed us to examine geographical and worldly trends in the research. Research type and data source were recorded to understand methodological diversity.

Technology type was specifically documented to differentiate between social media, gaming, smartphone use, or other digital platforms, highlighting the unique patterns and risks associated with each technology. Psychological and cognitive impacts were carefully defined to include outcomes such as anxiety, attention span reduction, stress, depression, and sleep disruption. Target population was considered a critical factor, with classifications such as adolescents, professionals, or general populations, helping to assess the vulnerability of different demographic groups. Intervention strategies were also documented, including digital detox programs, app restrictions, nudging techniques, and mindfulness-based approaches, allowing for evaluation of both preventative and corrective measures.

Furthermore, details of measurement tools, such as standardized surveys, validated scales, behavioural logs, clinical assessments, were recorded to assess the reliability of

reported findings. Applications in clinical and educational contexts were identified, particularly where studies offered practical solutions for managing technology addiction in schools, workplaces, or healthcare settings. Finally, each study’s reported outcomes, research gaps, and suggested interventions were extracted to identify patterns in the existing literature and highlight areas requiring further exploration. Where information was missing or unclear, assumptions were avoided, instead, efforts were made to cross-reference supplementary materials or related works to fill gaps. This ensured the strength of the collected data and minimized potential bias in interpretation.

Table 4. Data Variables Collected.

Field	Description
Paper ID	Unique identifier assigned to each study for reference during the review process.
Title	Full title of the article, used to classify the central focus of the study.
Year	Publication year to track trends over time (2015–2025).
Authors	Names of study authors for citation and authorship analysis.
Country	Geographical origin of the study, to assess regional patterns.
Research Type	Classification as qualitative, quantitative, or mixed methods.
Data Source	Primary sources of evidence, such as surveys, experiments, interviews, or logs.
Type of Technology	Digital platform examined (e.g., social media, gaming, smartphones).
Psychological / Cognitive Impacts	Reported effects such as anxiety, depression, sleep disruption, attention span, or cognitive overload.
Target Population	Groups under study (e.g., teens, professionals, students, or general public).
Intervention Strategies	Approaches aimed at mitigating addiction (e.g., digital detox, app restrictions, nudging, mindfulness).
Measurement Tools	Instruments and scales used (e.g., self-report surveys, validated psychological tests, behavioral tracking).
Clinical/Educational Applications	Relevance of findings for schools, healthcare settings, or workplace well-being initiatives.
Reported Outcomes	Main findings on focus management, digital well-being, and intervention effectiveness.
Research Gaps	Identified shortcomings in existing studies, including underexplored populations or methods.
Suggested Interventions	Recommendations for future strategies or policies to manage technology addiction.
Link	Reference link or DOI for traceability.

2.7. Study risk of bias assessment

In the included studies addressing technology addiction, focus management, psychological impacts, and digital well-being, it was crucial to assess the risk of bias to ensure the validity and reliability of the synthesized evidence. For this review, we employed the Newcastle-Ottawa Scale (NOS) for non-randomized studies (cohort and case-control) and the Joanna Briggs Institute (JBI) critical appraisal checklist for cross-

sectional studies, which were the most common designs in this research domain. The NOS evaluates studies across three domains, Selection, Comparability, and Outcome/Exposure, while the JBI checklist addresses methodological quality in terms of participant selection, measurement reliability, and data analysis.

Each study was independently assessed by three reviewers, and disagreements were resolved through group discussions. If agreement could not be reached, a fourth reviewer acted as the judge. No automation tools were used in this process to avoid algorithmic bias. For studies with insufficient or unclear details, such as incomplete reporting of intervention methods or measurement tools, additional steps were taken, such as cross-checking supplementary materials, related publications, or contacting authors when possible. This rigorous approach ensured that only studies with acceptable methodological quality were included in the final synthesis. The detailed Risk of Bias Assessment Process for Non-Randomized Studies is illustrated in Figure 4.



**Figure 4.** Risk of Bias Assessment Process for Non-Randomized Studies.

## 2.8. Synthesis Methods

In this systematic review on technology addictions and focus management, we applied rigorous synthesis methods to ensure that our findings were valid, transparent, and reproducible. The synthesis process was structured around six key steps, ranging from study eligibility and data preparation to the exploration of heterogeneity and sensitivity testing. This systematic approach was designed to accommodate both quantitative and qualitative evidence, allowing for a comprehensive understanding of the impacts of technology addictions and the effectiveness of focus management interventions in promoting digital well-being.

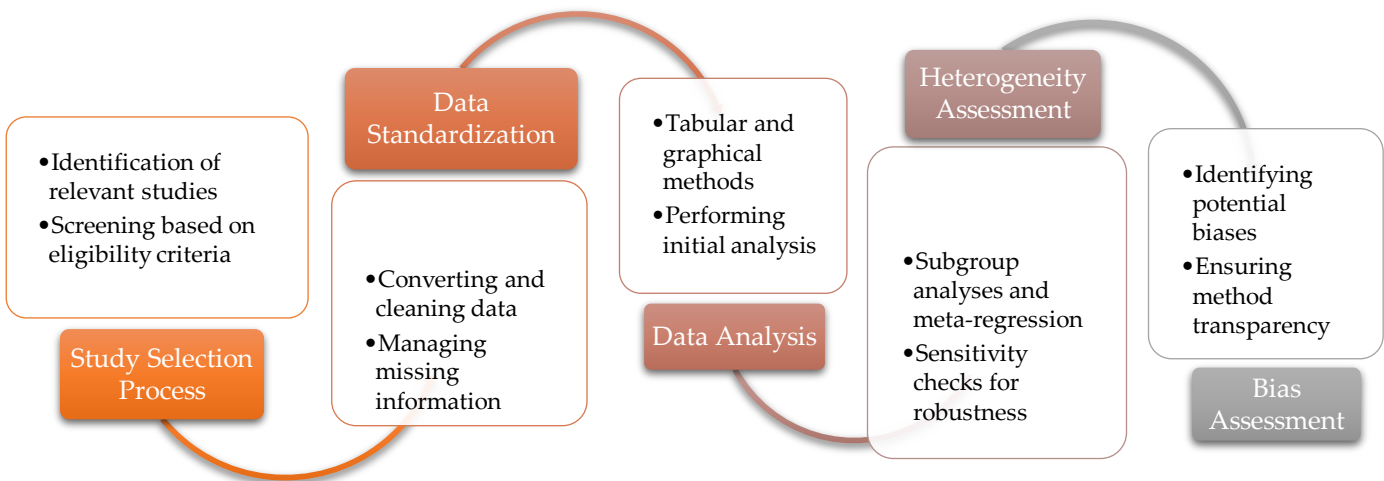


Figure 5. Systematic Review Process

2.8.1. Eligibility for Synthesis

To determine which studies were eligible for synthesis, we tabulated the characteristics of each included study, such as the type of addiction investigated, social media, gaming, smartphone use, intervention strategies for focus management, mindfulness training, digital detox programs, or time management tools, and reported outcomes, reduced screen time, improved academic/work performance, psychological well-being). These were then compared against our predefined synthesis groups. By using a structured comparison matrix, we ensured that only studies aligned with the research objectives and outcome domains were included. This step enhanced the rigor of the review by filtering out studies that did not contribute directly to the questions under investigation.

2.8.2. Data Preparation for Synthesis

To maintain consistency, we standardized outcome measures across studies. Where studies reported effect sizes in different forms, odds ratios, relative risks, or mean differences), algebraic conversions were applied to harmonize these into a common scale such as standardized mean differences or risk ratios, depending on the outcome type. Missing summary statistics, including standard deviations or confidence intervals, were addressed through imputation techniques based on established statistical methods. For qualitative studies, topic outcomes were organized into comparable categories to facilitate integration with the quantitative evidence base. This ensured that both numerical and narrative data could be synthesized cohesively.

2.8.3. Tabulation and Visual Display of Results

Results were presented through both structured tables and graphical displays. Tables were used to organize data by intervention type, outcome domain, and study quality, allowing for direct comparison across studies. Graphical tools such as forest plots were used to summarize effect estimates and confidence intervals for quantitative studies, highlighting variability and precision of findings. For qualitative outcomes, thematic maps and narrative tables were employed to illustrate repeated patterns, particularly in relation to focus management strategies and their reported effectiveness in enhancing digital well-being.

2.8.4. Synthesis of Results

The synthesis of results was guided by the heterogeneity observed across the included studies. Where sufficient quantitative data were available, we performed a random-effects meta-analysis, which allowed for variability across study populations, interventions, and outcome measures. For outcomes where meta-analysis was not possible, narrative synthesis was employed, with studies grouped by type of technology addiction and intervention strategy. Heterogeneity was quantified using the  $I^2$  statistic, and results were visually inspected using forest plots and funnel plots. Analyses were conducted using statistical software such as Excel, ensuring methodological rigor and duplication.

#### 2.8.5. Exploring Causes of Heterogeneity

To identify possible sources of heterogeneity, we conducted subgroup analyses based on key study characteristics such as participant age group, adolescents, university students, adults, type of technology involved, social media, gaming, general smartphone use, intervention type, behavioural vs. digital restriction tools, and study setting, educational, clinical, or workplace. Where sufficient data were available, meta-regression techniques were applied to examine the influence of these variables on outcomes such as focus improvement, screen-time reduction, and overall well-being. This process provided deeper insights into related factors that may explain differences in study results.

#### 2.8.6. Sensitivity Analyses

Sensitivity analyses were carried out to assess the strength of the synthesized results. These included re-analysing the data by excluding studies at high risk of bias, testing alternative statistical models, fixed-effects versus random-effects, and examining the impact of imputed data on final outcomes. Additionally, analyses were repeated with varying inclusion criteria, excluding small-sample studies or those with incomplete reporting to ensure that findings were not disproportionately influenced by weaker evidence. These checks strengthened the reliability of the conclusions and enhanced confidence in the implications of the review.

Through this structured and transparent approach, our synthesis methods ensured that the results of the review provide a balanced and reliable account of the evidence on technology addictions and focus management. The combined quantitative and qualitative evidence offers a comprehensive understanding of both the risks associated with technology overuse and the potential of targeted interventions to support digital well-being.

#### 2.9. Reporting bias assessment

In conducting our systematic review on technology addictions and focus management, it was essential to assess the risk of bias due to potentially missing results, particularly those arising from reporting biases such as selective publication, selective outcome reporting, or underreporting of negative findings. We recognized that these biases could significantly influence the validity and reliability of our synthesis, particularly given the wide variation in study designs and reporting standards in the field of digital well-being research. To address this, we employed a comprehensive and methodical approach using established graphical and statistical techniques. We used contour-enhanced funnel plots as a primary tool for visually inspecting asymmetries in the data. These plots allowed us to identify areas where studies might be missing due to potential reporting bias rather than random variation. The addition of statistical significance contours provided a clear method to differentiate between missing studies due to bias and those missing due to chance, offering a strong visual assessment of potential reporting bias (Khanyi et al. 2024).

We relied on well-documented and widely accepted methods rather than developing new tools. The methodological rigor of contour-enhanced funnel plots was particularly valuable in ensuring that our assessment was transparent, consistent, and aligned with best practices in systematic review methodology. To further minimize subjective bias, multiple independent reviewers conducted the evaluation of each study. Differences between reviewers were resolved through agreement discussions, or when necessary, by consulting an external methodological expert. In this review, we intentionally did not use automation tools to assess reporting bias. Instead, we adopted a manual approach, using software such as Excel to create and analyze plots. This hands-on method enabled careful examination of subtle patterns in the data that could indicate reporting bias. Additionally, we conducted manual searches across multiple databases, including Google Scholar, Scopus, and Web of Science, to cross-verify the completeness of our dataset. This ensured that our synthesis incorporated the most comprehensive and accurate evidence available, addressing potential gaps due to unpublished or selectively reported studies.

Given the combining nature of research on technology addictions and focus management, including psychology, education, and digital health studies, we adapted the standard methods for assessing reporting bias to suit this context. Differences in study reporting patterns across these disciplines required a careful, context-sensitive application of our tools to ensure relevance and accuracy. To promote transparency and replicability, all procedures and methods used to assess reporting bias have been documented in the supplementary materials accompanying this review. This allows other researchers to replicate our approach or build upon it in future investigations, contributing to the rigor and reliability of systematic reviews in the field of digital well-being research.

#### 2.10. Certainty assessment

The literature included in this systematic review was evaluated using a set of five quality assessment (QA) criteria to ensure rigor, relevance, and reliability of the findings: QA1: Clarity and explicitness of the research aim.

QA2: Transparency and appropriateness of data collection methods.

QA3: Clear definition and operationalization of key constructs, such as technology addiction and focus management strategies.

QA4: Application of a well-defined and appropriate research methodology, including study design and analytical techniques.

QA5: Contribution of the study findings to the understanding of impacts and solutions for digital well-being.

Each criterion was rated on a scale from 0 to 1, where 0 represents 'No', 0.5 represents 'Partially met', and 1 represents 'Yes'. Each study could thus receive a total score between 0 and 5 points. The overall percentage grading of each study's quality was calculated and used to support the certainty assessment of the body of evidence (Table 5). To strengthen the conclusions of this review, we conducted a rigorous assessment of the certainty of evidence using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) framework, a globally recognized method that provides a transparent and systematic approach to evaluating the quality of evidence (Molet et al. 2025).

**Table 5.** Certainty Assessment Results for Collected Literature.

Ref.	QA1	QA2	QA3	QA4	QA5	Total	% grading
[1,2,4,5,6,7,8,14,23,24,25,27,28,29,31,49,53,67]	1	0	0.5	0	1	2.5	50
[15,17,18,20,26,33,34,35,36,37]	0.5	0.5	0.5	0.5	1	3	60



[70,71,72,73,74,75,76,77,78,79,80,81,82,83,84]	1	0.5	0.5	1	0.5	3.5	70
[38,39,40,41,41,42,43,44,45,46,47,50,51,54,55,57,58,60,61,62,64,65,68,85,86,87,88,89,90,91,92,93,94]	1	1	1	1	0.5	4.5	90
[3,9,10,11,12,13,16,19,21,22,30,32,48,52,56,59,63,66,69]	1	1	1	1	1	5	100

The certainty of evidence for key outcomes in this review was assessed using several critical factors. Precision of effect estimates was evaluated by examining the sample sizes and confidence intervals reported in each study. Larger sample sizes and narrower confidence intervals indicated more reliable and precise results, thereby contributing to higher certainty. Consistency of findings across studies was also considered, with particular attention to whether results were similar across different populations, interventions, and contexts. When outcomes were consistent, confidence in the evidence was strengthened, whereas observed heterogeneity was further analysed to identify potential sources of variation. Risk of bias was evaluated using an adapted version of the Cochrane Risk of Bias tool, which considered study design, reporting practices, and potential methodological weaknesses. Studies identified as having a low risk of bias were deemed more reliable and contributed to higher certainty of the evidence. Directness was another key factor, assessed by examining the relevance of study populations, interventions, and measured outcomes in relation to the research questions of this review. High directness supported stronger confidence in the applicability of the findings to real-world digital well-being contexts. Potential reporting and publication biases were also considered, with studies examined for evidence of selective outcome reporting or missing results that could undermine the reliability of conclusions.

Based on these criteria, the certainty of evidence was categorized into four levels. High certainty was assigned when studies were precise, consistent, directly applicable, and exhibited a low risk of bias. Moderate certainty was applied when minor concerns existed in one factor, such as slight inconsistency or a moderate risk of bias. Low certainty reflected significant concerns across multiple areas, including imprecision, inconsistency, or high risk of bias, while very low certainty was reserved for cases where critical issues across all factors substantially reduced confidence in the findings. The GRADE framework was adapted specifically for outcomes related to technology addiction, focus management, and digital well-being interventions. Multiple independent reviewers assessed the certainty of evidence for each outcome, with any differences resolved through agreement discussions. Where necessary, additional data or clarifications were sought from study authors to ensure that the certainty assessments were strong, transparent, and reflective of the best available evidence.

### 3. Results

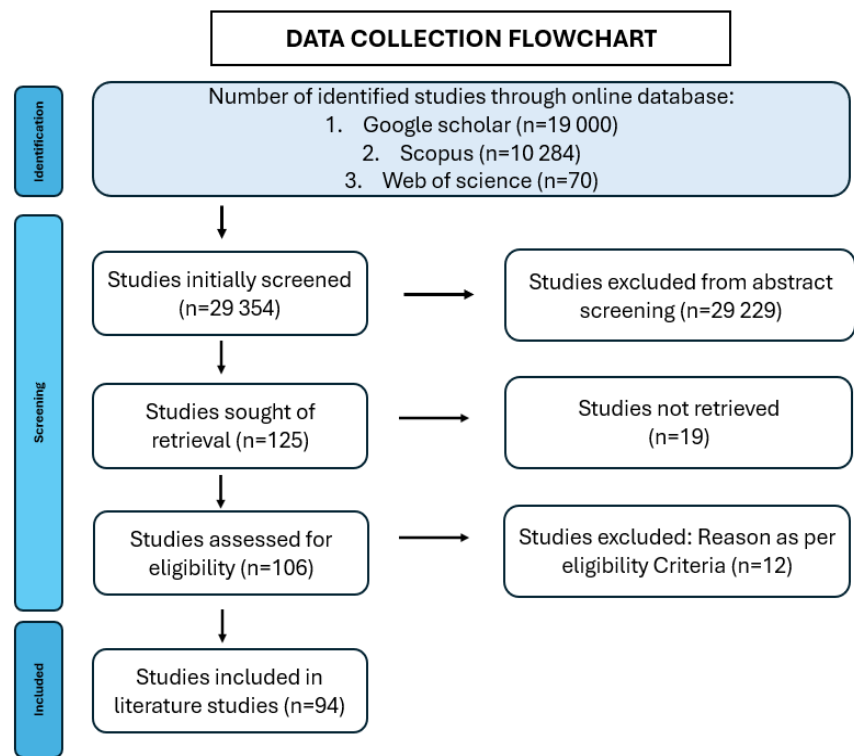
#### 3.1. Study Selection

##### 3.1.1. Flow of Studies

This section outlines the flow of steps in the selection procedure implemented for the systematic review through utilising search string keywords, with a key focus on technology addiction. A combined total of 29,354 were initially screened using three online repository systems namely, Web of Science (70), SCOPUS (10,284) and Google Scholar (19,000). Preliminary screening was conducted to determine the relevance of the retrieved papers through the eligibility evaluation. The process of selection resulted in a total number of 94 papers being included in the final review; 14 conference papers, 4 book chapters, 70 journal papers and 6 dissertations. The overall selection and screening process maps out the flow of recorded papers at each phase of the review and can be seen in Figure 6, following the PRISMA framework.



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Figure 6. Proposed PRISMA Flowchart.

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Figure 7 illustrates the percentage distribution of collected papers from each database. As depicted, Web of Science contributed 35% of the total research papers, followed by Google Scholar at 31% and Scopus at 28%. The intent of this reporting is to enhance transparency and support other researchers to follow the steps for verification of their results.

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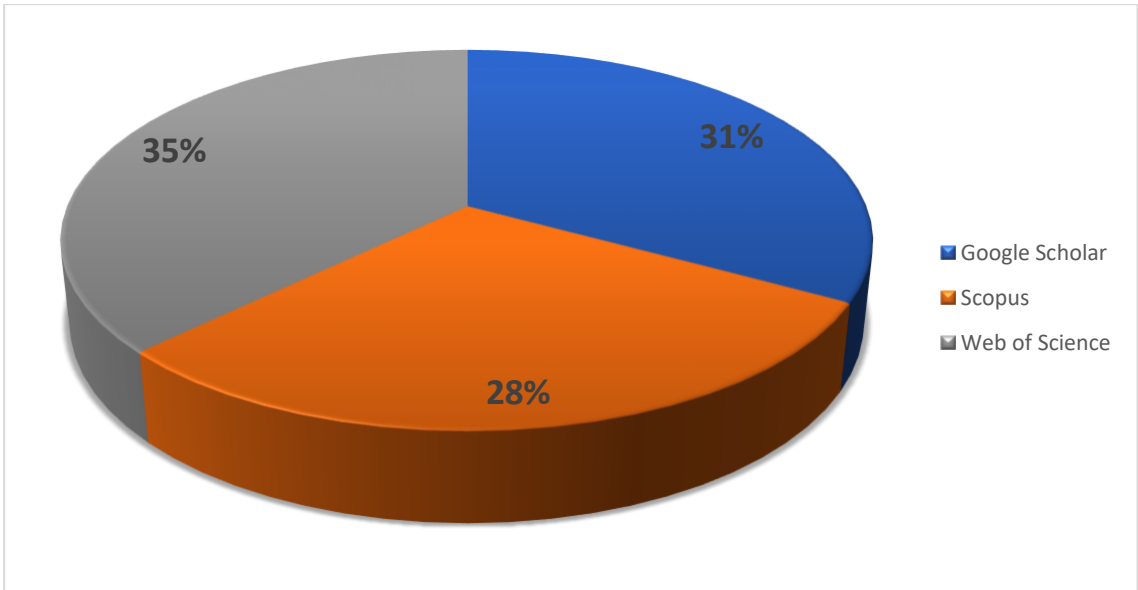
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Figure 7. Distribution of Online Repository.

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3.1.2. Excluded Studies

A total 29 354 papers were identified through online repositories, with Google Scholar having 19000 papers: SCOPUS possessing 10284 and Web of Science with 70 papers. After the initial screening of the title and abstracts, 29229 research papers did not meet the predetermined inclusion criteria. This meant they did not align with the intended research for this systematic review resulting in their exclusion. Out of 125 studies sought for retrieval, 19 were excluded due to restricted access and unavailable full text formats. The remainder of the studies (106) underwent the full-text eligibility screening process, where studies were excluded due to being published in a language either than English, publication year before 2015 and research framework not aligning with the technology additions and focus management.

3.2. Study Characteristics

This review encompasses a total of 94 peer-reviewed studies ranging from the year 2015 to 2025. The linear graph in Figure 8 demonstrates an annual increase in published papers over the decade, with the highest published studies in 2025 (31 studies). The peak year can also be noted in Table 6, highlighting the growing concerns over digital wellbeing and the strategies used to handle it. The rise in publications in the year 2025, was notable for all types of data formats, including book chapters, journal papers, and conference papers. As a result of growing global awareness of how smartphones, social media and various applications affect mental focus and productivity, has given rise to studies addressing these issues. The upward trend demonstrates a growing interest from both applied and academic perspectives in alleviating psychological effects of digital dependency.

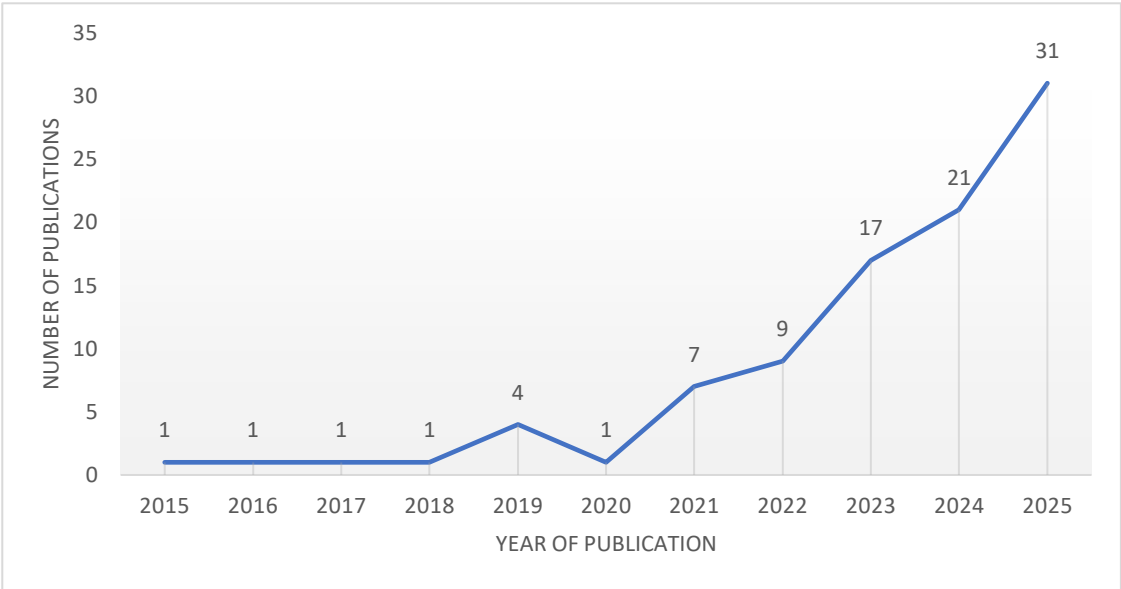


Figure 8. Yearly record of published research.

Table 6. Distribution of Research publications by year and category.

Year of Publications	Journal Paper	Dissertation	Conference Paper	Book Chapter
2015	1	0	0	0
2016	0	1	0	0
2017	1	0	0	0
2018	1	0	0	0
2019	4	0	0	0
2020	0	1	0	0
2021	5	0	2	0
2022	7	0	1	1
2023	10	1	5	0
2024	17	1	2	1
2025	24	1	4	2

Figure 9, indicates how 94 studies are categorised according to publication type. Vast majority of the papers are Journal articles with 74.5% of studies (70), emphasizing peer-reviewed and in-depth investigations into Technology addictions. Conference papers contribute 14.9% of studies, followed by dissertations (6.4%) and books with 4.2%. The collected data indicates focus areas of different frameworks to help mitigate and manage addictions related to technology and its health implications.

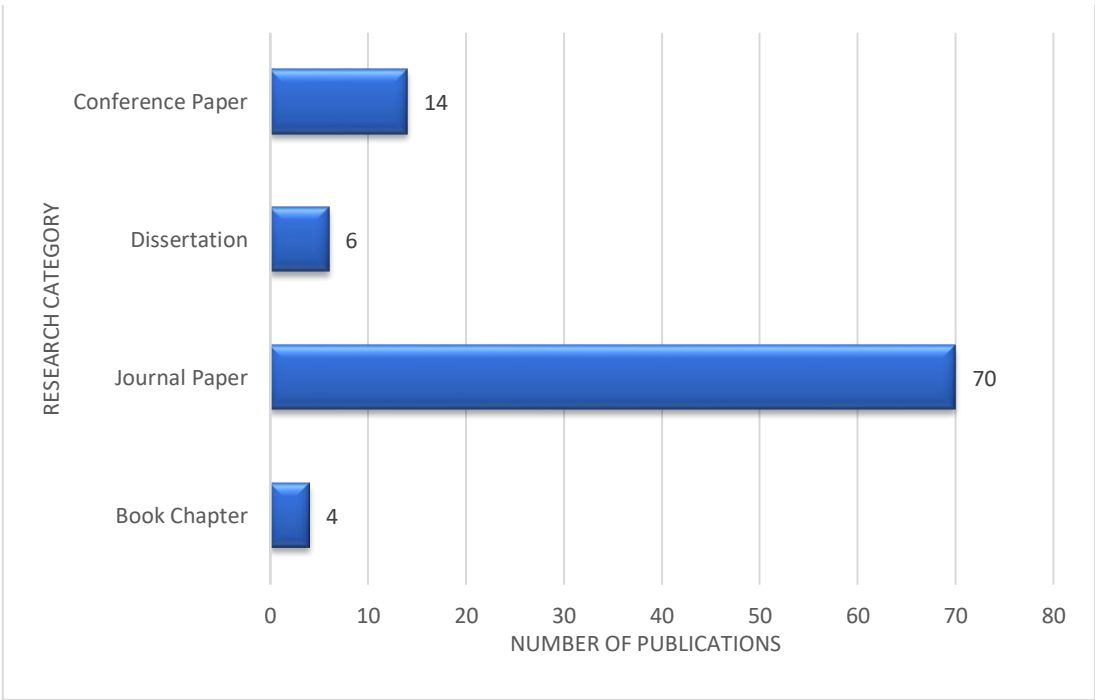


Figure 9. Number of Publications by research category.

3.3. Risk of Bias in Studies

The possibility of errors in evaluated studies cannot be ruled out, for this reason the Newcastle-Ottawa Scale (NOS) is used to evaluate the risk of bias and the quality of non-randomised studies. Table 7 shows the quality assessment table using the NOS scale to rate studies based on three categories, namely; Selection (0-4 stars), Comparability (0-2 stars) and Outcome/Exposure (0-3 stars). The outcome of the rating depends on the number of stars obtained per study, with 7 to 9 stars indicating high quality, 4 to 6 stars showing moderate quality and lastly 0-3 stars validating a low quality score. A presentation of the recorded assessment data can be seen in table 9, where 18 evaluated papers were rated as having high quality information (9 stars), 57 papers have moderate quality (6 stars) and 19 papers having the low-quality rating (4stars). The table highlights the methodological strengths and weaknesses of each individual study giving transparency and expounding on potential biases. This quality evaluation guaranteed that conclusions relied exclusively on sound methodological research.

In cases where a study's methodology was vague due to black-box or proprietary tools, additional steps were implemented to verify and cross-reference the results with other more transparent papers. This process was used to ensure that all studies were validated and unbiased.

Table 7. Assessment of Study Quality Using the Newcastle-Ottawa Scale.

Study ID	Selection (0-4 stars)	Comparability (0-2 stars)	Outcome/Exposure (0-3 stars)	Total Stars	Quality Rating
[1,2,4,5,6,7,8,14,23,24,25,27,28,29,31,49,53,67]	★★★★	★★	★★★	9	High
[15,17,18,20,26,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,50,51,54,55,57,58,60,61,62,64,65,68,70,71,72,73,74,75,76,77,78,79,80,81,82,	★★★	★	★★	6	Moderate

83,84,85,86,87,88,89,90,91,92,93,94]

[3,9,10,11,12,13,16,19,21,22,30,32,48,52,56,59,63,66,69]

★ ★ ★ ★ ★ 4

Low Quality Moderate

Figure 10 shows the analysed information from data collection methods. An observation of the included studies shows a reliance on self-reported measures for evaluating the impacts of digital addiction, with surveys (31 studies) being the predominant approach. Surveys rely on standardised psychometric scales to measure cognitive outcomes. Although this method is efficient, it is susceptible to recall bias, social desirability bias and limitations of self-assessment. Furthermore, systematic reviews (24 studies) and meta-analysis (15 studies), indicate an increasing focus on analysing existing evidence, even though their validity depends on primary studies. Direct observation (8 studies) was noted to be less common and was frequently applied in controlled settings, while a handful of studies had no specification on the methods used. Overall, the data collection methods highlighted the dominance of surveys, indicating the subjective nature of measuring technology addiction, while the lack of behavioural methods shows a key gap for future research.

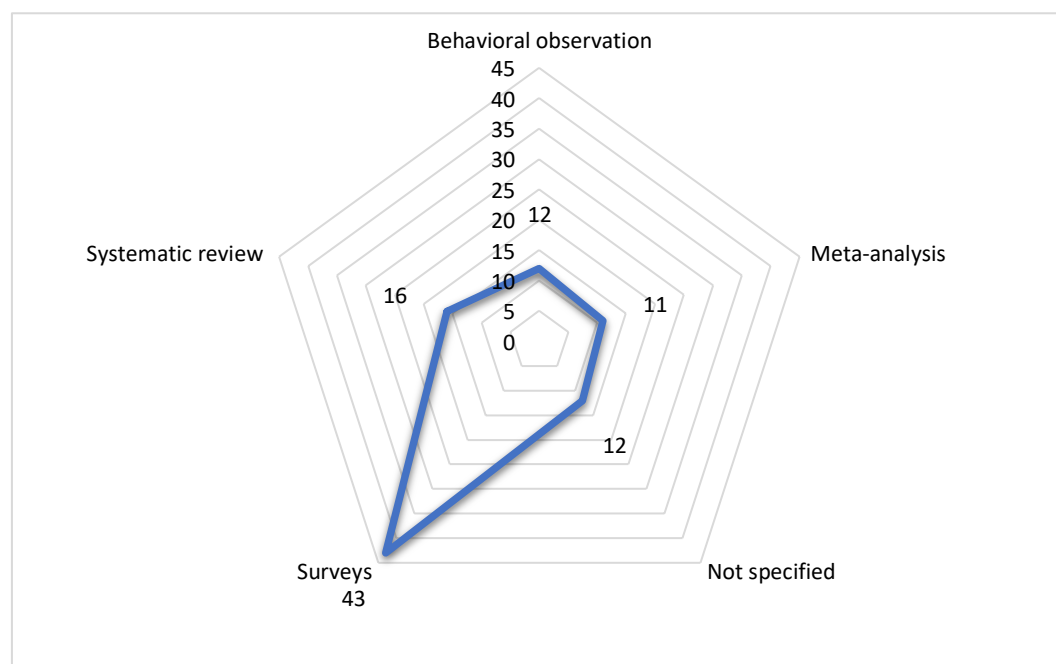


Figure 10. Data Collection Method.

### 3.4. Results of Individual Studies

Research shows how anxiety is the highest cognitive impact caused by over exposure to technology with a total of 38 papers. Studies on depression(21) and attention span(23), were also highly represented and included in a multitude of studies. Sleep disruption is a notable impairment accounting for only 12 studies which indicates less extensive research in this area. The analysed data indicates a collective focus on teens against categories such as attention, anxiety and depression. This suggests that researchers are primarily concerned about the effects of this phenomenon on the adolescent population and their cognitive development. However, there are limited number of studies focusing on sleep

deprivation and the professional’s population, signifying potential gaps that require greater attention in future studies to attain a more comprehensive grasp spanning all domains and demographics (Molete et al., 2025).

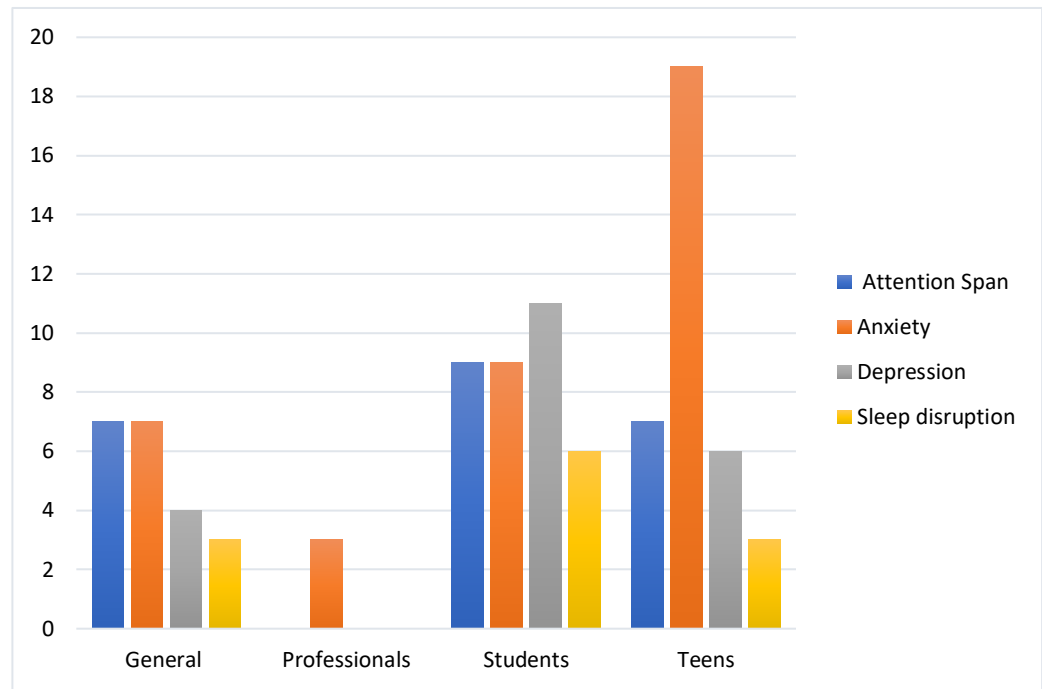


Figure 11. Cognitive Impacts by target population.

A visual illustration of the distribution of intervention strategies employed in most studies can be observed in Figure 12. Nudging, a frequently studied strategy appearing in 27 publications, is an extension from behavioural economics that guides human behaviours without restricting their freedom. App limits, highlighted in 21 publications, is a structured technology-based constraint focused at reducing screen usage intensity. Noticeably, 24 publications did not specify the strategy used, indicating a gap in methodology transparency and the necessity for clearer reporting criteria on future research (Msane et al., 2024;Pingilili et al., 2025). Altogether, the synthesised results suggest that there is a heavy research focus on a diverse array of intervention approaches. The repeated recommendation of detox and nudging strategies indicates that digital addiction is seen as a behavioural problem. The lack of methodological description underscores a need for uniform reporting in the future.

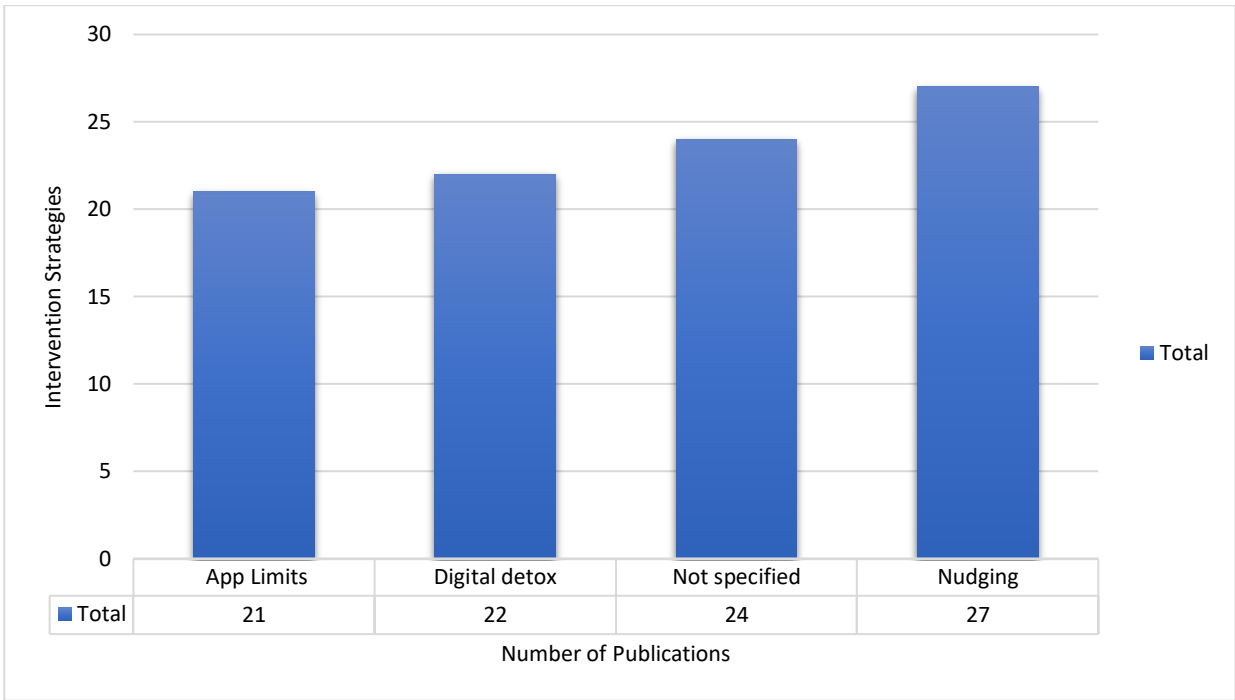


Figure 12. Number of interventions by Number of Publications.

3.5. Results of Synthesis

3.5.1. Characteristics of Contributing Studies

Published studies were arranged based on their fundamental field of application or disciplinary objectives. Dominating research originates from fields such as Psychology and Education Sciences, each contributing 30 studies. This is closely followed by Healthcare (22 studies), with substantial details that effectively address the clinical repercussions, diagnostic challenges and treatment plans for technology addiction. The remainder of the studies were distributed among three applications; Social media accounted for 7 studies, marketing gathered 1 study and 4 studies did not specify their field of application. Research focusing on social media use contributed 7 studies, while marketing represented only a single study whereas the remainder of the studies did not specify their field of application. The distributed information indicates the interdisciplinary nature of digital addiction research, with large contributions the education, psychology and healthcare disciplines; all looking to understand the drive, solutions and effects of this challenge.

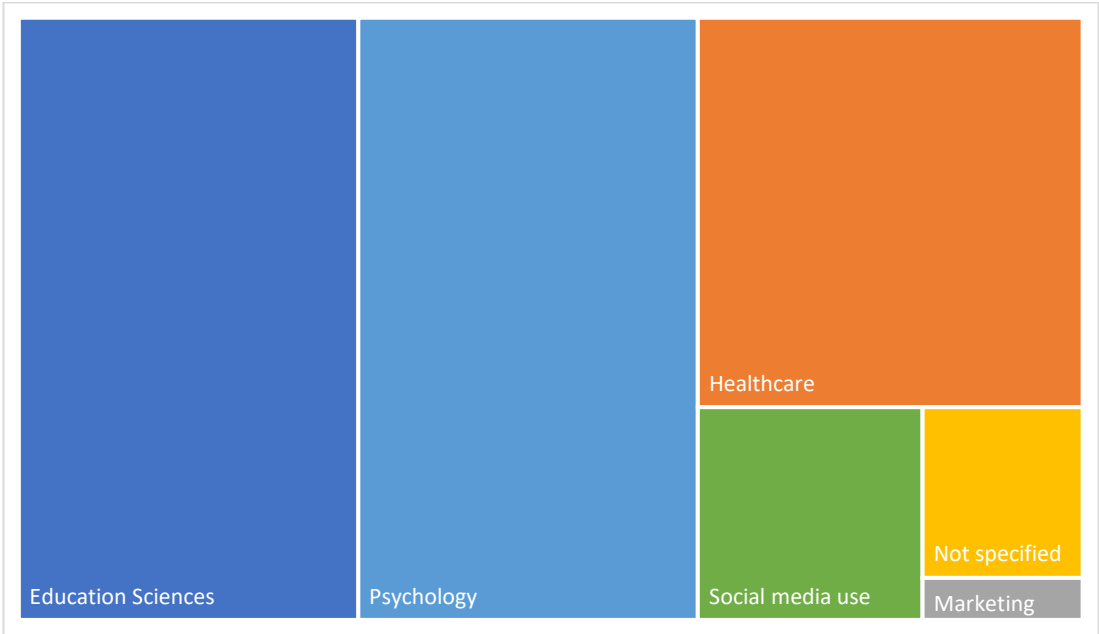


Figure 13. Heat-Map of Type of Application by Number of publications.

3.5.2. Results of Statistical Synthesis

Research output observed from the bar chart mapping in figure 14, indicates a geographically diverse pattern with contributions from both well-established and developing academic regions. Asia is the leading continent with the highest number of publications, China (34), India (7), Taiwan (4), South Korea (3), Pakistan (2) and others. The data indicates that Asia is a large contributor in studies focused on technology addictions. Europe is the second largest contributor with a total of 19 studies with a significant contribution from Italy (6) and Spain(5), often focusing on institutional interventions and neurobehavioral outcomes. North America is under-represented in this study with USA (5) being the only country while Africa shows increasing participation with a total of 4 papers from Ghana, Nigeria, Libya and South Africa indicating the global relevance of digital well-being across cultural and socio-economic boundaries.



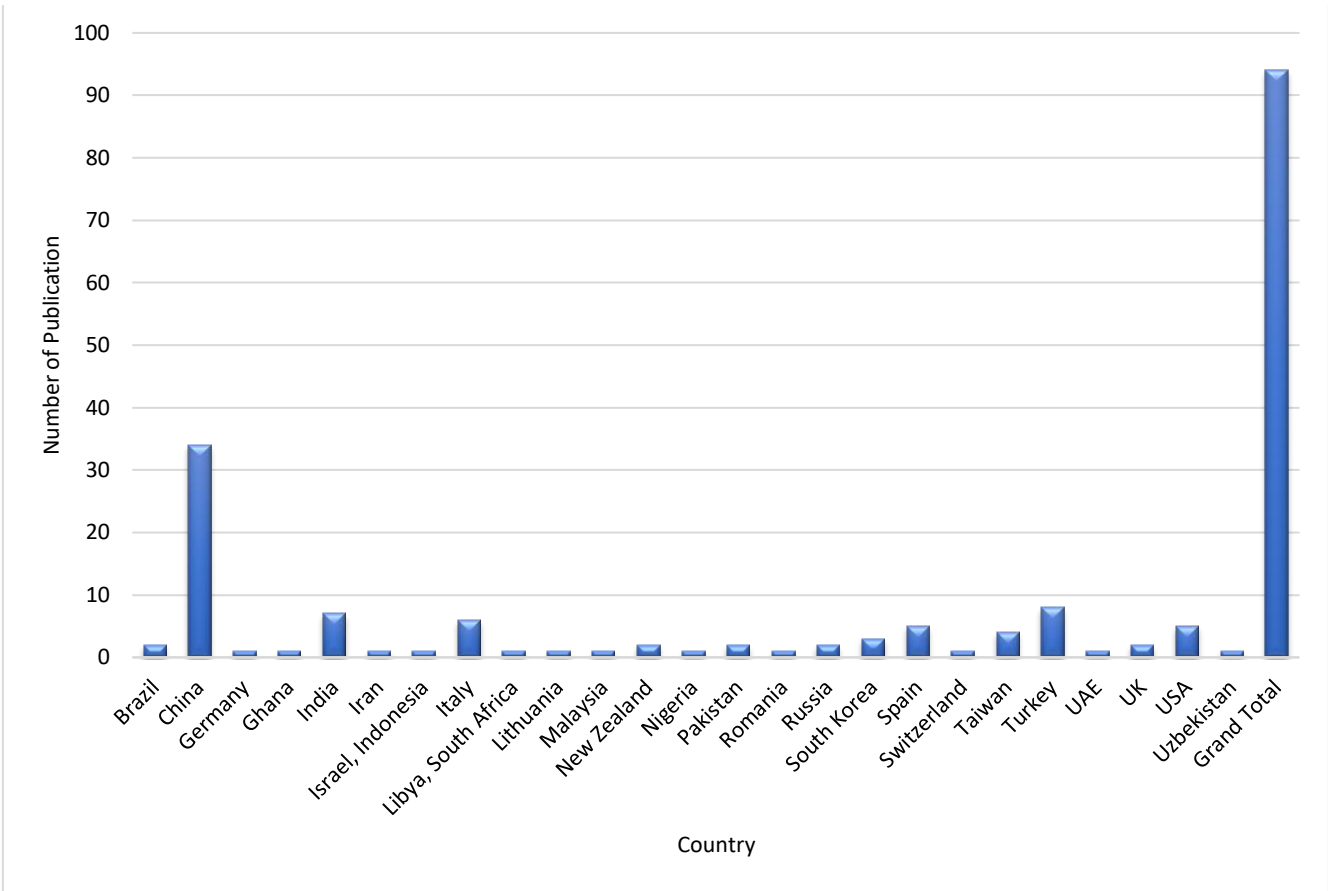


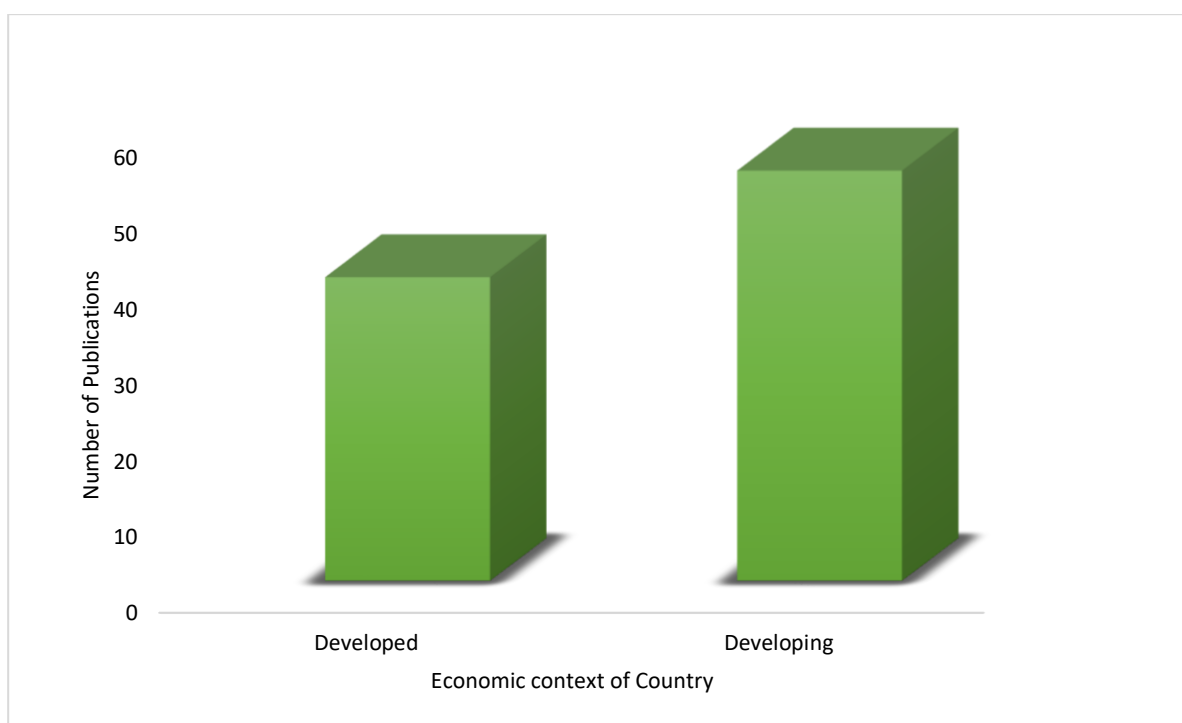
Figure 14. Geographical Distribution of peer-reviewed papers by country.

Figure 15 summarises the distribution of these characteristics by the population. The visual display of data shows a clear distinction in the research focus across the population groups. A considerable number of studies focusing on teens(44.7%), constituted the largest percentage of sampled data, showing a strong predominant concentration on this target group. The information implied that anxiety contributes the largest in cognitive impairment in teenagers. The second predominant research focus was aimed at students(29.8%) and general (19.1%). It is important to note that students and the general population, are affected almost uniformly by psychological impacts (Khanya et al., 2024; Ngcobo et al.,2024). Lastly, research focusing on professionals showed the least percentage of focus at 6.4% and only experiencing anxiety at a smaller scale.

3.5.3. Results of Investigations of heterogeneity

Results across different studies were noted to be significantly different, primarily driven by variations in economic health depending on the country where the study was conducted. A sub-group analysis was performed based on the World Banks’s classification of economies into developing and developed countries. The income-based categories classified according to the Gross National Income (GNI) per capita include low, lower-middle, upper-middle and high (Khanyi et al., 2024; Ngcobo et al., 2024).

Figure 11 depicts visual representation of data, revealing that developing economies contributed 67 published studies with research focusing on the rapidly digitising environments. Consequently, developed countries contributed a significantly smaller number with 26 included studies, where their research was centred on investigations of advanced technologies, and their cognitive impacts within overloaded digital landscapes.



**Figure 16.** Number of Publications by Economic context of Country.

#### 3.5.4. Results of sensitivity analysis

A sensitivity analysis was carried out to examine the shift when research is conducted on a particular type of technology. Figure 17 shows a visual representation of the distribution of technology types included in the studies. The analysis reveals that smartphones come forth as the dominant focus, accounting for 55% of the collected data. Smartphones are consequently linked to sleep deprivation and reduced physical activity, this is a clear indication of the capacity of control in everyday life.

Social media platforms can be seen as the second most studied category, appearing in 26% of the studies. Emotional regulation, patterns of engagement and social connectivity are topics often explored in studies related to social media platforms. Games, while less represented, are focused on in 17% of the studies and are associated with cognitive stimulation, behavioural addiction and conditions such as ADHD.

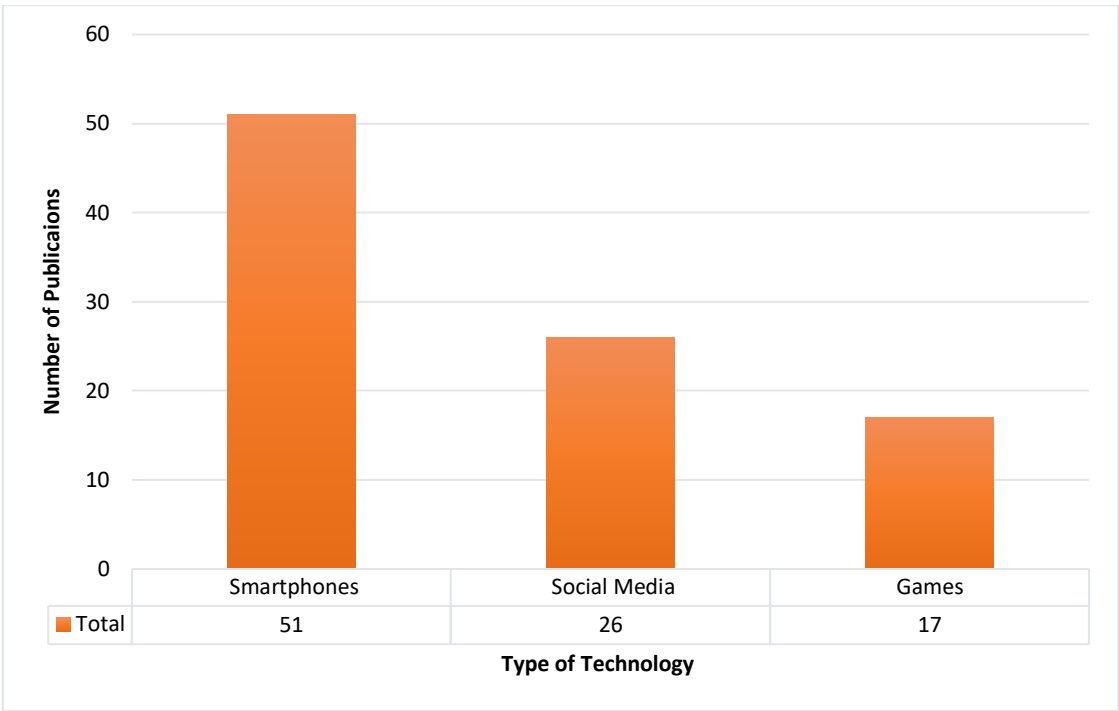


Figure 17. Type of Technology by Number of Publications

The sensitivity analysis validates that the findings are sensitive to technology type. The overall data is dominated by smartphones which influences general conclusions, but all the different types of technology require distinct intervention strategies.

3.6. Reporting Bias

The risk of reporting bias was evaluated through structured outcome reporting, transparency of methodological reporting and ultimately publication bias. Although, many studies evidently outlined their goals, a substantial number, especially from developed countries have a propensity in emphasizing strong positive findings while under reporting on critical outcomes. This observation suggests that the true effect of the publication bias is less impactful than the research actually suggests. Regardless, the use of diversified publication types and global sources assisted in mitigating this risk to some degree.

3.7. Certainty of Evidence

The certainty of evidence for the included studies on technology addictions, were assessed by taking into account methodological factors including directness, consistency and precision across each publication. From the 94 included studies, a substantial number utilised strong methodologies such as meta-analysis and systematic reviews, which have high levels of reliability. Additionally, the regular identification of key risk factors such as social pressures, Fear of Missing Out(FOMO) and low self-esteem, across diverse countries and populations adds to the robustness of the evidence. However, a moderate heterogeneity level was noted, with key limitations in studies reliant on self-reported data such as surveys, especially in upper-middle income countries. A major limitation being that 43 out of 94 studies were one-time surveys, therefore a heavy reliance on cross-sectional data has no direct link to prove that digital use causes problems. A summary of the comprehensive analysis of the studies confirmed that the certainty of evidence was found to be moderately reliable. Therefore, a need exists for additional research employing longitudinal and experimental methods to strengthen and enhance research findings across socio-economic contexts.

## 4. Discussion

### 4.1. General interpretation of results in the context of other evidence

The findings of this review, informed by the PRISMA framework, reveal that technology addiction significantly affects cognitive well-being, with anxiety, attention span reduction, and depression being the most frequently reported impacts. These outcomes align with previous reviews that emphasized the psychological strain of smartphone and social media overuse, particularly among adolescents. While existing research often isolates single platforms such as gaming or social media, this review synthesizes across multiple technologies, highlighting that smartphones 55% of reviewed studies dominate the literature and are consistently associated with poor sleep and reduced concentration.

Interventions were grouped into basics such as digital detox, intermediate like, app limits, and advanced strategies such as nudging. Evidence suggests that while nudging and app limits are the most common, there remains limited reporting on long-term outcomes and feedback mechanisms. Compared with prior reviews on digital wellness, this broader synthesis underscores both the scalability of focus-management tools and the gaps in standardized evaluation, suggesting that although interventions show promise, their sustainability and adaptability across contexts remain underexplored.

### 4.2. Limitations of the evidence included in the review

The evidence base demonstrates several limitations. First, a heavy reliance on cross-sectional surveys (43 out of 94 studies) raises concerns about causality, as such designs cannot confirm whether technology overuse directly causes psychological impairment. Second, much of the data is self-reported, which is prone to recall and social desirability bias. Third, studies disproportionately target adolescents and students, leaving professionals and older adults underrepresented, even though these groups also face productivity and focus-related challenges. Fourth, while meta-analyses and systematic reviews within the included evidence strengthen reliability, a lack of longitudinal studies limits understanding of long-term effects and intervention durability. Lastly, many interventions did not specify methodologies or behavioral feedback systems, reflecting a transparency gap that weakens comparability across studies.

### 4.3. Limitations of the review processes used

Despite adopting rigorous inclusion criteria and established quality appraisal tools, this review has its own constraints. The review was limited to English-language publications between 2015–2025, which may have excluded relevant evidence from other languages and contexts. The reliance on three databases, Google Scholar, Scopus, and Web of Science, ensured broad coverage but may still have missed gray literature or unpublished findings. Data harmonization techniques such as converting outcomes into standardized mean differences, introduced necessary assumptions that could affect precision. Moreover, heterogeneity across study designs, populations, and intervention types limited the feasibility of meta-analysis for all outcomes, necessitating narrative synthesis for some results. Finally, while bias assessments were conducted rigorously, the absence of automation tools may have introduced subjectivity in reviewer judgments.

### 4.4. Implications of the results for practice, policy, and future research

The synthesized evidence has several implications:

- Practice: Educators, healthcare professionals, and workplace managers can implement targeted digital wellness strategies, such as integrating mindfulness training into curricula or using apps to monitor screen-time

behavior. Practical adoption should prioritize age-appropriate and culturally relevant tools while balancing privacy and accessibility.

- Policy: Policymakers should consider regulating persuasive app designs that exploit addictive behaviors, while supporting funding for evidence-based digital wellness programs in schools and workplaces. Standardized reporting of intervention outcomes should be encouraged to enhance comparability and accountability across programs.
- Future research: More longitudinal, experimental, and cross-cultural studies are needed to establish causal links and assess the durability of interventions. Underexplored populations, such as professionals and older adults, warrant further investigation. In addition, integrating biometric feedback, IoT devices, and AI into intervention strategies offers promise but must be balanced with ethical safeguards, particularly concerning privacy and data security.

## 5. Conclusions

This systematic review highlights the critical impact of technology addiction on cognitive focus and digital well-being across diverse populations. Key findings reveal that smartphones were the most studied technology, accounting for 55% of the evidence base, followed by social media, 26% and gaming, 17%, reflecting their dominant role in shaping attention and mental health outcomes. Anxiety and reduced attention span emerged as the most frequently reported cognitive impacts, affecting 60% of the reviewed studies, while depression and sleep disruption were comparatively underexplored. Interventions clustered into three categories: basic approaches such as digital detox,, intermediate methods including app limits, and advanced nudging techniques. However, a large proportion of studies lacked detailed reporting on intervention design or long-term outcomes, limiting comparability and practical application. Geographically, developing economies contributed the majority of publications (67 studies), emphasizing the global relevance of technology overuse, while developed economies focused more on advanced intervention testing.

Despite these insights, significant gaps remain. The heavy reliance on cross-sectional surveys and self-reported data introduces methodological weaknesses and raises concerns about causal inference. Furthermore, professionals and older adults were underrepresented, while adolescents and students dominated the research focus, leaving gaps in understanding how different populations experience and manage technology-related distractions. Limited transparency in intervention mechanisms and scarce longitudinal evidence highlight the need for more robust and standardized evaluation practices.

Future research should prioritize longitudinal and experimental studies to better establish causal pathways and measure the long-term effectiveness of interventions. Expanding research into underexplored populations, improving methodological transparency, and incorporating ethical frameworks around biometric tracking and data privacy are essential to strengthen the evidence base. Policy and practice should focus on promoting ethical app design, integrating age-appropriate wellness tools in education and workplaces, and fostering accessible, culturally relevant interventions. Addressing these limitations will ensure that digital wellness strategies evolve into scalable, sustainable solutions capable of mitigating technology addiction and enhancing focus management globally.

## Appendix A

**Table A1.** Comprehensive Overview of Technology Addictions and Focus Management.

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Ref.	Research Focus	Methodology	Key Outcomes	Challenges Identified	Recommendations
Ding et al. (2024)	The Effects of Digital Addiction on Brain Function and Structure of Children and Adolescents: A Scoping Review	Journal Paper	Digital addiction linked to brain function impairment, reduced cognitive control	Lack of longitudinal data	Balanced digital use
Jin & Jiang (2025)	Theoretical Perspectives on Adolescent Internet Addiction: A Comprehensive Literature Review	Journal Paper	Conceptual frameworks linking social, psychological, and behavioral factors	Lack of consensus on theory	Cross-cultural studies
Gulyamov & Rodionov (2024)	Cyber Hygiene as an Effective Psychological Measure in the Prevention of Cyber Addictions	Dissertation	Cyber hygiene effective but limited evidence	Lack of awareness	Responsible tech use
Lu et al. (2025)	Interventions for Digital Addiction: Umbrella Review of Meta-Analyses	Journal Paper	Interventions show moderate effectiveness but inconsistent evidence	Weak evidence base, small samples, publication bias	Integrated prevention for anxiety/gaming, exercise, counseling
Koo & Kwon (2015)	Risk and Protective Factors of Internet Addiction: A Meta-Analysis of Empirical Studies in Korea	Journal Paper	Identified key risk and protective factors	Underestimation of family/peer dynamics	Focus on intrapersonal variables, coping, family/peer role integration

Zhou et al. (2024)	A model for risk factors, harms and of smartphone addiction among nursing students: A scoping review	Journal Paper	Smartphone addiction linked to multiple health/learning issues	Lack of interventions tested	Optimize biopsychosocial model factors
Zahrai et al. (2022)	Conceptualizing Self-control on Problematic Social Media Use	Journal Paper	Self-control theories applied to social media	Reliance on self-report, weak theoretical evidence	Strengthen self-control interventions
Martínez-Hernández & Lloret Iltes (2024)	Are School-Based Interventions Effective in Preventing Internet Misuse? A Systematic Review	Journal Paper	10 of 11 programs effective in prevention	Lack of standardized tools	School-based interventions
Singha & Singha (2025)	Digital Well-Being and Internet Addiction Across the Lifespan	Book Chapter	Academic stress, peer influence, workplace demands, entertainment pressures contribute to addiction	Denial, relapse, lack of awareness, peer/social pressure, weak policies	Balanced screen time
Khan et al. (2024)	Addicted to Pixels: Understanding Screen Addiction and Strategies for Prevention	Journal Paper	Notifications, FOMO, social pressure, family dynamics, personality traits, device design drive addiction	Denial, relapse, lack of awareness, peer pressure, socioeconomic barriers, weak policy frameworks	Parental monitoring
Sandua (2024)	The Double Sides of Technology	Book Chapter	Accessibility, peer/social workplace demands, FOMO, pressure,	Limited empirical data	Tech-free zones

Tabish (2025)	Digital Addiction: The Emerging Epidemic of Modern Age	Journal Paper	Notifications, accessibility, FOMO, infinite scroll, autoplay, cultural norms	Policy gaps	School integration	curriculum
Goel & Singla (2025)	Mental Health and Smartphone Addiction: Understanding the Digital Impact on Well-Being	Book Chapter	Accessibility, habitual use, influence	FOMO, peer relapse, pressure	Lack of awareness, peer/social	App limiters
Gonçalves et al. (2023)	Digital Dependence in The Past Decade: A Systematic Review	Journal Paper	Nomophobia, organizational social pressure	FoMO, demands,	Lack of awareness, gender differences, organizational blind spots	Restrictive use policies
Ben Hkoma et al. (2025)	Between Addiction and Immersion: A Correlational Study of Digital and Academic Behaviour Among Engineering Students	Conference Paper	Academic delays, poor time management, notification checking	Lack of awareness, blurred academic-leisure boundaries		Digital literacy workshops
Vettriselvan et al. (2025)	Health Impacts of Smartphone and Internet Addictions Across Age Groups	Conference Paper	Age-related vulnerabilities & differences in digital impacts	Lack of tailored interventions by age		Intergenerational campaigns
Duradoni et al. (2025)	Exploring the Role of Online Social Capital in Differentiating Technology Addiction Effect on Well-Being	Journal Paper	Online social capital moderates the impact of technology addiction on well-being; supportive networks buffer negative effects	Limited cultural scope		Encourage healthy online communities



Bayar & Kayalar (2023)	Technology Addiction as One of the Risks of Adolescence	Journal Paper	Adolescents are at high risk of technology addiction, which may affect mental health and academic performance	Lack of longitudinal studies on technology addiction interventions in adolescents	Implement structured digital well-being programs in schools, parental awareness initiatives
Adarkwah & Huang (2023)	Technology addiction, abduction and adoption in higher education: Bird's eye view of the ICT4AD policy in Ghana 20 years on	Dissertation	ICT4AD policy adoption limited; technology usage in HE still in infancy	Situational factors limiting adoption; lack of longitudinal adoption studies	Strengthen policy implementation, increase stakeholder engagement, develop structured ICT adoption programs
ere (2023)	Examination of College Students' Technology Addiction Levels	Journal Paper	63.13% of students had low levels of technology addiction; girls had lower scores; differences observed across faculties; physical activity negatively correlated with addiction	Limited insight into intervention strategies and longitudinal impacts	Promote physical activity, develop digital well-being programs tailored by gender and faculty
Akstinaite & Šarkauskaitė (2025)	Social media addiction	Journal Paper	Social media can boost self-esteem and creativity but can also lead to addiction and harmful reliance	Lack of quantitative measurement of addiction levels and longitudinal effects	Develop structured digital well-being programs, promote mindful social media use
George & Shaji (2024)	Overcoming the Collective Action Problem: Enacting Norms to Address Adolescent Technology Addiction	Journal Paper	Adolescent tech overuse linked to anxiety, depression, and disrupted sleep; collective peer pressure drives overuse	Challenges in parental enforcement and social norms adoption	Implement coordinated norms via schools, families, and communities; limit early access to smartphones and social media

Zhou et al. (2024)	A model for risk factors harms and of smartphone addiction among nursing students: A scoping review	Journal Paper	Prevalence of SA among nursing students ranged from 19% to 72%. Proposed a theoretical model (I-PACE) identifying personal, affective, cognitive, and executive risk factors.	Future research investigating harm mitigation through optimizing predisposing, precipitating and perpetuating factors is warranted.	Interventions targeting identified risk factors (e.g., improving self-control, social support, managing usage duration).
Andrade & Hoyle (2023)	A synthesis and meta-analysis of the relationship between trait self-control and healthier practices in physical activity, eating, and sleep domains	Conference Paper	Trait self-control is modestly associated with engagement in health-related activities, with stronger associations for sleep. Associations varied by outcome type (health-promotion vs. health-risk).	Role of other individual differences, contextual affordances, and biological factors in explaining behaviors.	Health behavior interventions considering individual differences in self-control.
Shahjehan et al. (2021)	A META-ANALYSIS OF SMARTPHONE ADDICTION AND BEHAVIORAL OUTCOMES	Journal Paper	Positive significant relationship between SA and overall behavioral outcome. Positive correlation with anxiety, depression, loneliness, mental health issues, low self-control/regulation, stress, withdrawal. Negative correlation with self-esteem. Depression was the most consistent outcome globally.	Not specified	Not specified
Coco et al. (2025)	The Brain in the Age of Smartphones and the	Journal Paper	Inverse relationship between	Future research should focus on developing	Promoting physical activity, particularly sports, along

	Internet: The Possible Protective Role of Sport		smartphone/internet use and physical activity. Sports linked to reduced addictive behaviors, enhanced psychological well-being, and improved emotional resilience.	tailored interventions and studying diverse populations.	with psychological interventions.
Yeun & Han (2016)	Effects of Psychosocial Interventions for School-aged Children's Internet Addiction, Self-control and Self-esteem: Meta-Analysis	Dissertation	Psychosocial interventions had a large effect for reducing IA (SMD -1.19) and improving self-control (SMD 0.29) and self-esteem (MD 3.58). Group treatments, selective approach, long duration, community setting, or higher grade had larger effects.	Further research using RCT design or diverse age groups needed.	Psychosocial intervention to prevent Internet addiction in school-aged children.
Zhou et al. (2024)	The correlation between mobile phone addiction and procrastination in students: A meta-analysis	Journal Paper	Significant positive correlation between MPA and procrastination ( $r = 0.376$ ). Moderated by education level, sex, culture, and MPA measurement tools.	Not specified	Attention should be paid to the identification and intervention of MPA to prevent students from procrastination.
Liu et al. (2017)	Effects of Group Counseling Programs, Cognitive Behavioral Therapy, and Sports Intervention on Internet Addiction in East Asia: A	Journal Paper	All three interventions significantly reduced IA levels. Group counseling improved time management, interpersonal/health	Not specified	Group counseling programs, cognitive behavioral therapy, and sports intervention.

	Systematic Review and Meta-Analysis		issues, tolerance, compulsive use. CBT improved various psychopathological symptoms. Sports intervention improved all IA dimensions and withdrawal symptoms.		
Cuppone et al. (2021)	The role of repetitive transcranial magnetic stimulation (rTMS) in the treatment of behavioral addictions: Two case reports and review of the literature	Conference Paper	Decrease of addictive symptoms and improvement of executive control observed in two cases (online porn use and IGD). Suggests rTMS might represent a potential effective treatment for BAs.	Not specified	Neurocircuit-based interventions, such as rTMS.
Astatke et al. (2023)	A literature review of the effects of social networking sites on secondary school students' academic achievement	Journal Paper	SNS use is both positively and negatively related to academic achievement. Negative impacts from excessive use, inappropriate use, and recreational use. Identified mediating (internet addiction, cyberbullying, explicit material) and moderating (gender, sleep, time management) factors.	Not specified	Intervention mechanisms to address inappropriate and excessive use of SNS by students.

Balcha & Chen (2025)	Child-Computer Interaction Dynamics: A Systematic Review of Social Media Embedded Interactive Tools and Their Psychological Impacts	Dissertation	Interactive tools have diverse psychological impacts but introduce significant risks. Parental controls are crucial but effectiveness varies. A gap exists regarding newer features (live streaming, AR, polls).	Impact of newer features is not observed.	Improved parental control options.
Chen & Kuo (2025)	The Relationship Between Screen Time, Media Multitasking and Executive Functions in Adolescents	Journal Paper	Avg weekly digital device use: 30.98 hrs. Media multitasking negatively correlated with working memory, attention, and inhibitory function. Positively correlated with depression. Correlations were weak. Digital device usage time showed fewer significant correlations.	Bidirectional relationship across different age groups needs exploration.	Promoting healthy digital media habits based on findings.
Ye et al. (2025)	Effects of physical activity on smartphone addiction in Chinese college students-chain mediation of self-control and stress perception	Journal Paper	Physical activity reduces smartphone addiction by improving self-control and lowering stress perception; chain mediation confirmed	Cross-sectional design (no causality), limited to two universities in central China (low generalizability), short-term	Encourage physical exercise in universities, strengthen self-control programs, integrate stress-reduction interventions, expand longitudinal studies
Zhao et al. (2025)	Mobile phone addiction and interpersonal problems among Chinese young adults: the	Journal Paper	MPA positively associated with interpersonal problems; loneliness & social anxiety mediate	Self-report	Social-skills training

	mediating roles of social anxiety and loneliness		independently and sequentially		
Wang et al. (2025)	Effects of parental psychological control on mobile phone addiction among college students: the mediation of loneliness and the moderation of physical activity	Journal Paper	Parental psychological control ↑ MPA; loneliness mediates; physical activity buffers the effect	Cross-sectional and self-report	Optional app limits
Peng et al. (2025)	Mobile phone addiction was the mediator and physical activity was the moderator between bullying victimization and sleep quality	Journal Paper	Bullying victimization poor sleep; MPA mediates; physical activity moderates (buffers)	Self-report	School anti-bullying + phone-use policies; app limits at night
Wang et al. (2025)	Relationship between adolescent gaming addiction and myopia, ocular surface condition, and health status: a questionnaire-based cohort study	Journal Paper	Gaming addiction associated with myopia/ocular surface complaints and poorer health scores	Self-report bias	Time limits for gaming
Cheng et al. (2025)	Perfectionism, obsessive-compulsive behaviour, and anxiety in young adults: a moderated mediation model of mobile phone addiction	Journal Paper	MPA prevalence 56.5%; perfectionism → MPA, partially via compulsive behavior; anxiety strengthens the pathway	Self-report	App time-caps & nudges

Liu et al. (2025)	Anxiety mediated the relationship between bullying victimization and internet addiction in adolescents, and family support moderated the relationship	Journal Paper	Bullying victimization predicts IA via anxiety. Family support buffers the anxiety from bullying.	Cross-sectional design, self-report bias, single-item for bullying	Strengthen family communication and support systems, school programs for emotional regulation
Wang et al. (2025)	Physical activity moderates the mediating role of depression between experiential avoidance and Internet addiction	Journal Paper	Experiential avoidance predicts IA via depression. Physical activity buffers this relationship.	Self-report data, sample representativeness, cross-sectional design	Incorporate physical activity into mental health interventions for college students
Dong et al. (2025)	Cross-lagged panel relationship between physical activity atmosphere, psychological resilience and mobile phone addiction on college students	Journal Paper	PAA negatively predicts MPA directly and indirectly by increasing psychological resilience.	Short longitudinal period, focus on international students	Create a positive physical activity atmosphere on campus to improve resilience and reduce MPA
Rabiei et al. (2025)	Validation of the Farsi version of the video-game addiction scale for children: its associations with social media addiction, internet addiction and executive functions	Conference Paper	VASC is a valid and reliable tool. Game addiction correlated with worse executive functions, higher IA and SM addiction.	Male-dominated sample, self-report for children, no clinical diagnosis	Use of the validated VASC scale for early identification and intervention in children.
Makas & Koç (2025)	The mediating effect of emotional schemas in the relationship between	Conference Paper	Online gaming addiction reduces life satisfaction by fostering maladaptive	Cross-sectional design, self-report bias, sample	Clinical interventions should focus on restructuring emotional

	online gaming addiction and life satisfaction		emotional schemas (e.g., guilt, seeing emotions as harmful).	limited to university students	schemas to improve life satisfaction.
Liu et al. (2024)	The chain mediating effect of anxiety and inhibitory control between bullying victimization and internet addiction in adolescents	Conference Paper	Bullying leads to IA through increased anxiety and reduced inhibitory control.	Cross-sectional design, cannot establish causality.	Interventions should focus on improving inhibitory control and reducing anxiety.
Liu et al. (2024)	Physical activity moderated the mediating effect of self-control between bullying victimization and mobile phone addiction among college students	Journal Paper	Bullying victimization predicts MPA via reduced self-control. Physical activity buffers this effect.	Cross-sectional design, self-report measures.	Use physical activity as an intervention to enhance self-control and mitigate MPA.
Liu et al. (2024)	The relationship between physical activity and internet addiction among adolescents in Western China: a chain mediating model of anxiety and inhibitory control	Journal Paper	Physical activity reduces IA by decreasing anxiety and improving inhibitory control.	Cross-sectional design, self-report bias.	Increase physical activity as a strategy to prevent and reduce adolescent internet addiction.
Costanza et al. (2023)	Use and Abuse of Digital Devices: Influencing Factors of Child and Adolescent Neuropsychology	Conference Paper	Describes various digital pathologies (IAD, Social Media Addiction, Nomophobia, FOMO, Vamping, Hikikomori) and their symptoms.	Official recognition of "digital disorders" in diagnostic manuals (DSM/ICD) is lacking. Effect of technology on psychophysical development is still a topic of research.	Calls for developing preventive strategies and interventions to mitigate risks to mental and social health.



Amendola et al. (2025)	Bidirectional relationship between gaming disorder, psychological distress, and well-being: A systematic review with meta-analysis of longitudinal studies	Journal Paper	Bidirectional relationships: GD $\rightleftharpoons$ Depression, GD $\rightleftharpoons$ Life Satisfaction. Unidirectional relationships: Anxiety $\rightarrow$ GD, Loneliness $\rightarrow$ GD. Effect sizes were small to medium.	Causal mechanisms are unclear due to observational data. Lack of studies using clinical interviews. Generalizability limited to community samples of young people.	Findings do not justify population-level prevention for GD due to small effect sizes but support integrated treatment for affected individuals.
Dezfouli & Srite (2022)	Investigating the Role of Cultural Factors in Developing Smartphone Addiction	Journal Paper	Cultural values significantly affect antecedents of smartphone addiction (e.g., self-regulation, attachment style)	Lack of longitudinal studies, limited to one country sample, no direct intervention tested	Future studies could design culture-based digital well-being interventions (e.g., culturally adaptive nudging, counseling, or app features)
Ning et al. (2022)	Is Musicians' Music Playing and Creating Habit Associated with Smartphone Addiction?	Journal Paper	Music playing/creating habit increases smartphone addiction; PAP reduces this impact; smartphone use during PAP reduces PAP's effect	Limited existing research on musicians, need empirical data collection, lack of longitudinal validation	Promote physical activity among musicians, design interventions balancing music practice with healthier smartphone use
Mestre-Bach et al. (2023)	Independent Component Analysis for Internet Gaming Disorder	Dissertation	Altered DMN, ECN, SN connectivity	Small sample sizes, male-only studies, cultural bias	Longitudinal studies, diverse populations
Ricci et al. (2023)	Impacts of Technology on Children's Health: A Systematic Review	Journal Paper	Negative impacts on verbal intelligence, sleep, and emotional regulation	Limited experimental studies, lack of age-specific data	Parental involvement, health professional training
Salerno et al. (2022)	ADHD-Gaming Disorder Comorbidity in Children and Adolescents	Journal Paper	ADHD increases risk and severity of GD	Lack of standardized diagnostic tools, gender bias	Personalized treatment, parent training, serious games

Weinstein & Siste (2022)	Excessive and Problematic Smartphone Usage	Journal Paper	PSU linked to psychiatric and neurological changes	No diagnostic consensus, limited intervention studies	Develop standard diagnostic tools, behavioral interventions
Cuppone et al. (2021)	rTMS in Behavioral Addictions: Two Case Reports and Review	Journal Paper	Reduced craving, improved executive control, sustained recovery	Small sample size, no control group, limited generalizability	Larger trials, standardized protocols, integration with psychotherapy
Dmitriev & Zvezdina (2021)	Features of the Impact of Digital Technologies on Young People	Journal Paper	Two subtypes of addiction identified, links to personality traits	Lack of longitudinal data, cultural bias, no intervention tested	Motivation/value-based therapy, personality-tailored prevention
Brand et al. (2021)	Affective and Cognitive Mechanisms of Internet-Use Disorders	Journal Paper	Validated I-PACE model, mapped cognitive-affective pathways	Need for disorder-specific mechanisms, longitudinal validation	Personalized CBT, affective-cognitive targeting, digital biomarkers
Bernabéu & Marchena (2020)	Internet addiction and executive functions in university students	Dissertation	Evidence of executive dysfunction linked to internet addiction	No clear addiction risk profile, lack of differentiation by application, gender, task type	Targeted prevention, application-specific studies
Berezovskaya et al. (2019)	Internet addiction and youth coping strategies	Journal Paper	Internet addiction weakens positive coping strategies	Gender differences not fully explored, limited cultural scope	Coping-based training, preventive psycho-education
Podo et al. (2019)	A Smart Approach to Face Distraction Issue due to Smartphone Usage running Social Networks	Journal Paper	Proof-of-concept shows potential to reduce distraction and promote socialization	No large-scale testing, short-term validation only	Large-scale trials, integration with behavioral therapy

Gong (2025)	Behavioral impulsion, habituation, or regulation? A tripartite model of hedonic technology addiction	Journal Paper	Developed tripartite model (BIS, BHS, BRS) explaining drivers of addiction	Lack of cross-cultural validation; need for longitudinal studies	Design interventions to strengthen regulation system (BRS), reduce impulsion (BIS), and manage habituation (BHS)
Hans et al. (2024)	The Psychology Behind Addictive Applications in Technology	Journal Paper	Apps deliberately exploit cognitive/emotional mechanisms to increase retention	Limited empirical testing of proposed mechanisms; lack of user-based longitudinal data	Promote ethical design, digital well-being policies, and user education on addictive mechanisms
Iqbal et al. (2024)	Scrolls and Shadows: Mapping the Silent Surge of Social Media Addiction and Social Anxiety through Bibliometric Analysis	Journal Paper	Exponential rise in SMA–anxiety research post-2020; AI-driven content linked to compulsive use	Need for more cross-cultural studies, gender-focused coping mechanisms, neurological impacts of long-term exposure	Interdisciplinary collaboration, ethical AI design, policy frameworks to mitigate hyper-connectivity
Bilderback (2024)	Screen time addiction and mental health: navigating work-life balance in global careers	Journal Paper	Screen time disrupts work-life balance, worsens mental health, cultural/economic disparities shape experiences	Need empirical validation of interventions, long-term career impact studies, and research on AI/VR in work-life balance	Organizational policies reducing 24/7 digital availability, culturally adaptive strategies, digital wellness initiatives
Udulu (2025)	Prevalence and Determinants of Internet Addiction in Nigeria: A Review of Current Trends and Future Challenges	Journal Paper	Internet addiction negatively affects individuals (mental health, performance) and society (healthcare costs, productivity loss)	Need for longitudinal studies, cross-cultural analysis, big data/mixed methods	Collaborative strategies involving policymakers, researchers, and tech developers
Wu & Chou (2023)	A Bibliometric Analysis to Identify Research Trends	Journal Paper	Identified 10 categories of interventions; research volume rising yearly; Asia	Limited focus on older adults; smartphone addiction not yet	Expand studies to broader age groups; integrate cross-cultural perspectives;

	in Intervention Programs for Smartphone Addiction		(China, South Korea) dominant	internationally classified as a disorder	explore physiological and psychological recognition of smartphone addiction
Rajan et al. (2018)	Virtual Reality Gaming Addiction	Journal Paper	Minimal existing research on VR addiction; addictive patterns identified	Lack of empirical studies on intervention efficacy	Develop specific interventions for VR gaming addiction, raise awareness, apply treatment strategies
Aboujaoude et al. (2022)	Online Psychology Beyond Addiction and Gaming: A Global Look at Mental Health and Internet-Related Technologies	Book Chapter	Identified global trends, digital mental health risks, and age-related differences in technology use	Need for cross-cultural validation, longitudinal studies, intervention efficacy	Promote interdisciplinary interventions, age-specific strategies, digital literacy, mental health policies
Lee et al. (2023)	Online addictions are real: What are technology educators doing about it?	Conference Paper	Evidence sparse on effects of digital addiction; highlighted need for safety and support measures	Lack of empirical studies on educational impact of digital addiction	Support options for educators and students at risk, policy and curriculum adjustments
Yurduseven Evci (2022)	An Evaluation on The Problem of Digital Addiction in Youth	Conference Paper	Highlights risks and negative consequences of excessive digital use	Lack of empirical studies on interventions applied in real-world settings	Support limited, useful, and productive use of digital media; prevention-focused strategies
Shivanand (2023)	Exploring the Relationship between Social Media Use and Technology Addiction in Adolescents: A Literature Review	Conference Paper	Social media features like FoMO, personalization, likes/comments contribute to addiction	Limited research on effective interventions and prevention for adolescents	Develop targeted intervention and prevention strategies for social media addiction
Chukwuere & Chukwuere (2024)	The Challenges of Technology: Psychological	Conference Paper	Psychological factors like FOMO, social comparison,	Limited empirical studies on targeted interventions	Design interventions targeting fundamental

	Factors that Drive Youths' Addiction to Social Media		and escapism contribute to addiction	for youth social media addiction	psychological factors driving addiction
Özyirmidokuz et al. (2023)	#GAMEADDICTED: A Machine Learning Framework for Digital Game Addiction Detection and Early Intervention	Conference Paper	XGBoost achieved 93.06% accuracy; practical interface developed for preliminary diagnosis	Limited real-world validation beyond the dataset; only text-based indicators	Expand dataset diversity, real-world deployment, integration with counseling or support programs
Paiman & Fauzi (2024)	Exploring determinants of social media addiction in higher education through the integrated lenses of technology acceptance model (TAM) and usage habit	Journal Paper	Usage habit is a strong predictor of social media addiction; TAM variables also contribute	Limited studies integrating TAM and usage habit in higher education contexts outside Malaysia	Tailored educational programs promoting responsible technology usage and reducing addiction risk
Ertemel et al. (2023)	Smartphone Addiction Assessment Using Pythagorean Fuzzy CRITIC-TOPSIS	Journal Paper	Integrated fuzzy MCDM approach successfully ranks candidates' addiction levels	Limited real-world application beyond decision-model validation	Apply methodology for clinical or educational interventions to prioritize treatment
Bilici & Işık (2025)	Strategic Approaches of Non-Governmental Organizations in Combating Internet Addiction	Journal Paper	NGOs effectively increase visibility and societal impact in combating internet addiction	Limited empirical measurement of intervention effectiveness	Expand evaluation to measure impact of NGO strategies on behavioral change
Aragay et al. (2024)	Differences in Screen Addiction in the Past 15 Years	Journal Paper	Increase in screen addiction over time; video game addiction increased more and affected younger patients	Limited granularity on psychosocial determinants and long-term outcomes	Design targeted preventive programs for different types of screen addiction, especially video games

Sun et al. (2024)	Self-control as mediator and social support as moderator in stress-relapse dynamics of substance dependency	Journal Paper	Perceived stress increases relapse; self-control mediates this; social support moderates it.	High relapse rates persist despite interventions; need for comprehensive strategies.	Integrated interventions strengthening both internal (self-control) and external (social support) resources.
Wei et al. (2023)	Escaping negative moods and concentration problems play bridge roles in the symptom network of problematic smartphone use and depression	Journal Paper	"Escaping negative moods" (PSU) and "concentration problems" (depression) are key bridge symptoms.	Current internet use theories do not fully explain the role of concentration as a mediator.	Interventions targeting specific symptom connections and bridge symptoms.
Zhao et al. (2024)	The roles of classmate support, smartphone addiction, and leisure time in the longitudinal relationship between academic pressure and social anxiety among Chinese adolescents in the context of the double reduction policy	Journal Paper	Classmate support and PSU mediate the academic pressure-social anxiety link. Leisure time changes moderate these relationships.	Not specified	Active parental participation in leisure time management and guidance towards positive coping styles.
Wu et al. (2024)	Longitudinal relationship between mobile phone addiction and adolescents' perceived stress: mediating role of self-control and moderating role of physical exercise	Journal Paper	MPA increases stress by increasing impulse and decreasing control. Physical exercise moderates this effect (protective at high levels).	Not specified	Highlighted control systems and physical activity as protective factors.

Zhang et al. (2022)	Perceived stress and mobile phone addiction among college students: The roles of self-control and security	Journal Paper	Perceived stress lowers self-control, leading to MPA. This link is stronger for individuals with low security.	Not specified	Concrete approaches for prevention and intervention are required.
Rashi et al. (2021)	Adverse Effect of Social Media Addiction on Life Effectiveness of Adolescents: An Approach towards Mental Health and Mood Modifications	Conference Paper	Significant negative correlation between Facebook addiction and life effectiveness dimensions.	Not specified	Not specified
Zhou et al. (2022)	Internet addiction and child physical and mental health: Evidence from panel dataset in China	Journal Paper	IA negatively impacts physical/mental health by reducing sleep and exercise. Stronger effect on urban and left-behind children.	Time spent online is an imperfect measure of IA. Generalizability beyond China is tentative.	Targeted programs to prevent IA, especially for students.
Li et al. (2021)	Loneliness and Mobile Phone Addiction Among Chinese College Students: The Mediating Roles of Boredom Proneness and Self-Control	Journal Paper	Loneliness leads to MPA via boredom and low self-control. Sequential mediation was full.	Not specified	Mobile phone addiction can be eliminated by exercising self-control and alleviating boredom proneness.
Rao (2019)	From Confucianism to Psychology: Rebooting Internet Addicts in China	Journal Paper	Argues IA is a cultural idiom of distress related to social control, not a universal syndrome of self-control.	Not specified	Not specified
Wang et al. (2025)	Physical exercise and bedtime procrastination	Journal Paper	Physical exercise reduces bedtime procrastination	Not specified	Not specified

	among college students: mediating roles of self-control and mobile phone addiction		by fostering self-control, which mitigates mobile phone addiction.	
Wang & Wang (2025)	The Emotional Reinforcement Mechanism of and Phased Intervention Strategies for Social Media Addiction Journal Paper		Proposes independent/interactive positive (reward) and negative (avoidance) reinforcement pathways. Not specified	Phased intervention strategies tailored to addiction stage.
Shuaishuai (2025)	The effects of physical activity on adolescent psychological sub-health: chain-mediated effects of self-control and mobile phone addiction Journal Paper		PA reduces PSH directly and indirectly through the chain of increasing self-control and reducing MPA. Not specified	Offers theoretical and practical perspectives for employing PA.
Sagar et al. (2023)	Problem Solving Skills and Internet Addiction in Gifted Children Journal Paper		High problem-solving skills decrease internet addiction. Not specified	Not specified
Bagatarhan et al. (2023)	Parenting and Internet Addiction among Youth: The Mediating Role of Adolescent Self-Control Journal Paper		Maternal parenting (monitoring, support, etc.) is indirectly linked to IA through adolescent self-control. Not specified	Improving both parenting and self-control are fruitful avenues for intervention.
Tudorel et al. (2019)	Romanian Version of the Internet Addiction Test: Psychometric Properties and Cross-Gender Invariance Journal Paper		The Romanian IAT is a valid, reliable, and gender-invariant two-factor tool. Not specified	Not specified



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