



Impact of a Digital Detox Program on Screen Time and Sleep Hygiene in Adolescents

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ABSTRACT

Objective: This study aimed to assess the effectiveness of a structured digital detox program in reducing screen time and improving sleep hygiene among Chinese adolescents.

Methods and Materials: Thirty adolescents (aged 13–17) were recruited and randomly assigned to an experimental (n = 15) or control (n = 15) group. Over ten weekly sessions, the experimental group participated in a digital detox intervention featuring psychoeducation, cognitive-behavioral techniques, and goal-setting to minimize excessive screen use. Sleep hygiene education was incorporated through discussions on bedtime routines and reducing nighttime device exposure. The control group received no intervention. Data were collected at three time points: pre-intervention, post-intervention, and a five-month follow-up. Outcomes included self-reported measures of daily screen time and sleep hygiene scores. Repeated measures analysis of variance was conducted to evaluate within- and between-group changes, and Bonferroni post-hoc tests were applied to identify significant pairwise differences.

Findings: The experimental group demonstrated a notable decline in mean daily screen time, from 6.82 hours (SD = 0.76) at baseline to 4.31 hours (SD = 0.65) post-intervention, which remained stable at 4.07 hours (SD = 0.61) at follow-up. Sleep hygiene scores improved significantly, rising from a baseline of 81.27 (SD = 6.24) to 93.18 (SD = 5.77) post-intervention and stabilizing at 92.46 (SD = 5.51) at follow-up. In contrast, the control group showed minimal changes across these time points. Statistical analyses confirmed significant time × group interactions for both variables (p < .001).

Conclusion: Incorporating structured sessions, behavioral monitoring, and sleep education may contribute to healthier technology habits and better sleep practices in this population.

Keywords: Digital detox, Screen time, Sleep hygiene, Adolescents, Randomized controlled trial, Behavioral intervention, China.

1. Introduction

Excessive screen time among adolescents has become a pressing concern worldwide as modern lifestyles increasingly revolve around digital devices such as smartphones, tablets, and laptops (Saeed et al., 2024; Wickham et al., 2024; Xu et al., 2024). The term “screen time” encompasses a broad range of activities, including social media browsing, video streaming, gaming, and online communication, all of which can be habit-forming and time-consuming (Dzierzewski et al., 2024; Kushwaha et al., 2024; Rowland, 2023). While technology has enabled adolescents to stay connected, pursue educational goals, and engage in creative pursuits, excessive and unregulated digital media use has been associated with a variety of health risks, including poor sleep outcomes, emotional distress, and reduced physical activity (G et al., 2024; Maulida et al., 2024; Nguyen et al., 2024). As awareness of these risks grows, researchers and healthcare practitioners have turned attention toward interventions that can moderate screen use and promote healthier sleep behaviors in young people (Coel et al., 2022; Hale & Dzierzewski, 2024; Hale et al., 2024).

A growing body of evidence indicates that adolescents’ screen time has steadily increased over the past decade, with many reporting usage well above four hours per day (Beluli, 2023; Zain & Hanif, 2023). This trend is fueled by the ubiquitous presence of social media platforms, online gaming environments, and the requirement of digital devices for school-related tasks (Arnardóttir & Cunningham, 2023; D. & R., 2023; Toprak & Karan, 2022). The COVID-19 pandemic appears to have further accelerated these patterns, as remote learning and social distancing measures pushed more educational and recreational activities online (Bolshakova et al., 2024; Richards & Gutter, 2023). In China, where youth face especially high academic demands, digital technology use has become deeply ingrained in daily life, with adolescents often relying on devices for study aids, social networking, and entertainment (Huang et al., 2023; Xu et al., 2024). This rising prevalence of screen exposure underscores the necessity for early preventive measures that encourage moderation, balanced schedules, and awareness of potential health implications (Samintharapunya & Choksamut, 2023; Schouwenaars, 2023a, 2023b).

Among the numerous health risks tied to excessive screen time, sleep disturbance ranks as one of the most urgent concerns (Hale & Dzierzewski, 2024; Lee & Cho, 2023; Rowland, 2023). Adolescence is a critical developmental period marked by hormonal changes, shifting circadian

rhythms, and psychosocial stressors that increase vulnerability to sleep problems (Dzierzewski et al., 2024; Muslimah & Khotimah, 2022; Pchelina et al., 2022). Sufficient, quality sleep is vital for cognitive functioning, emotional regulation, and overall physical health; sleep deficits during these formative years can thus negatively affect academic performance, mood stability, and long-term health outcomes (Maulida et al., 2024; Nguyen et al., 2024; Richards & Gutter, 2023). Multiple studies have identified a clear relationship between screen-based activities—particularly those taking place close to bedtime—and insufficient or poor-quality sleep (Azzahrah, 2025; G et al., 2024; Hale et al., 2024). Mechanisms that may explain this association include the stimulating nature of engaging digital content, mental alertness induced by interactive technologies, and exposure to blue light from device screens, which can suppress melatonin production and delay the onset of sleep (Coel et al., 2022; Huang et al., 2023; Lee & Cho, 2023).

In addition to its effect on circadian rhythms, excessive screen time can erode overall sleep hygiene—an umbrella term referring to the practices, habits, and environmental factors conducive to quality rest (D. & R., 2023; Rowland, 2023; Toprak & Karan, 2022). Adequate sleep hygiene involves maintaining a regular bedtime routine, limiting stimulant consumption, ensuring a comfortable sleeping environment, and avoiding electronic devices late in the evening (Hale & Dzierzewski, 2024; Saeed et al., 2024; Schouwenaars, 2023a). In recent research, adolescents who did not practice healthy sleep hygiene were more likely to exhibit bedtime procrastination, further increasing their daily screen exposure and diminishing their total sleep time (Beluli, 2023; Maulida et al., 2024). These unhealthy patterns risk becoming self-reinforcing cycles: as teenagers lose sleep, they may rely more heavily on digital activities for stress relief or social engagement, exacerbating their sleep deprivation over time (Coel et al., 2022; Dzierzewski et al., 2024; Nguyen et al., 2024). Therefore, strategies to reduce excessive device use and restore healthy sleep habits must tackle this interplay of biological, behavioral, and psychosocial factors.

One promising approach to curbing harmful device use is the concept of a “digital detox,” typically defined as a deliberate, time-limited reduction or cessation of engagement with digital devices, particularly for non-essential or recreational purposes (Azzahrah, 2025; Hale et al., 2024). Digital detox programs have been proposed as interventions for individuals experiencing technology

overuse or addiction-like behaviors, aiming to interrupt problematic patterns of use, increase awareness about triggers, and instill more intentional, balanced practices (Arnardóttir & Cunningham, 2023; Beluli, 2023; Kushwaha et al., 2024). Preliminary evidence suggests that such programs can foster positive changes in screen-related behavior by helping participants set boundaries, identify core values, and engage in alternative offline activities (Pchelina et al., 2022; Schouwenaars, 2023b; Zain & Hanif, 2023). However, empirical research on digital detox interventions specifically targeting adolescents—and focusing on sleep outcomes—remains relatively sparse.

Despite the dearth of experimental data, pilot studies indicate that adolescents who engage in structured digital detox programs often report improvements in emotional well-being, academic performance, and family relationships, along with a decline in self-reported technology dependency (G et al., 2024; Nguyen et al., 2024; Richards & Gutter, 2023). By systematically restricting screen use, these interventions may also alleviate the detrimental effects of blue light, overstimulation, and social media notifications that impede the onset and maintenance of sleep (Bolshakova et al., 2024; D. & R., 2023; Kushwaha et al., 2024). Furthermore, behavioral components of detox programs—such as goal-setting, self-monitoring, and stimulus control—can strengthen sleep hygiene practices and encourage consistency in bedtime routines (Dzierzewski et al., 2024; Saeed et al., 2024; Zain & Hanif, 2023). Many of these techniques originate from cognitive-behavioral therapy for insomnia (CBT-I), adapted for the specific context of digital device overuse (Hale et al., 2024; Maulida et al., 2024; Rowland, 2023).

Although the impetus for designing and implementing digital detox interventions is strong, research in this domain faces several methodological challenges. First, longitudinal data collection is essential to ascertain whether reductions in screen time and enhancements in sleep hygiene persist over extended periods (Arnardóttir & Cunningham, 2023; Muslimah & Khotimah, 2022; Schouwenaars, 2023a). Second, objective metrics of screen time (e.g., device usage logs) and sleep parameters (e.g., actigraphy) can bolster the reliability of self-report measures, though feasibility constraints in adolescent populations often limit objective assessments (Coel et al., 2022; Hale & Dzierzewski, 2024; Richards & Gutter, 2023). Third, controlling for confounding factors, such as external academic pressures, co-occurring mental health issues, or inconsistent family policies, is crucial to accurately attribute any observed

benefits to the detox program alone (Rowland, 2023; Saminthaapunya & Choksamut, 2023; Wickham et al., 2024). Finally, cultural context may influence adolescents' perception of screen use, thereby affecting engagement with the intervention; for instance, in China, rigid academic schedules and family expectations may shape both digital consumption patterns and attitudes toward sleep (Huang et al., 2023; Lee & Cho, 2023; Xu et al., 2024).

The present study aims to address these gaps by conducting a randomized controlled trial to examine the effects of a digital detox program on screen time and sleep hygiene among Chinese adolescents.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a randomized controlled trial design to evaluate the impact of a digital detox program on screen time and sleep hygiene in adolescents. A total of 30 adolescents aged 13 to 17 years were recruited from schools in urban areas of China through announcements and parental consent. Participants were randomly assigned into two groups: an experimental group ($n = 15$) that received the digital detox intervention, and a control group ($n = 15$) that did not receive any intervention during the study period. Inclusion criteria included regular school attendance, access to personal digital devices, and self-reported high screen time and poor sleep quality. Exclusion criteria included diagnosed sleep disorders, use of sleep-related medication, or participation in other behavioral programs targeting screen use or sleep. The intervention lasted ten weeks, and all participants were followed up for five months after the end of the program to assess long-term effects.

2.2. Measures

2.2.1. Screen Time

To assess screen time among adolescents, the study utilized the Screen Time Questionnaire (STQ) developed by Jago et al. (2011). This standardized self-report tool evaluates the duration and frequency of screen-based activities, including television viewing, computer use, video gaming, and smartphone usage, during both weekdays and weekends. The questionnaire includes 10 items across two subscales: weekday screen time and weekend screen time. Participants are asked to estimate their average daily time spent on each screen-based activity. Responses are recorded in hours and minutes, and total screen time is calculated by

summing across activities and time periods. The STQ has demonstrated strong psychometric properties, with high test-retest reliability and acceptable internal consistency. Its validity has been confirmed through comparison with objective screen-time monitoring devices in previous studies (Nagata et al., 2023; Xu et al., 2024).

2.2.2. Sleep Hygiene

Sleep hygiene was evaluated using the Adolescent Sleep Hygiene Scale (ASHS) developed by LeBourgeois, Harsh, and colleagues in 2005. This instrument is specifically designed to assess behaviors and environmental factors that affect sleep quality in adolescents. The ASHS consists of 28 items categorized into six subscales: physiological, cognitive, emotional, sleep environment, daytime sleep, and substance use. Participants respond on a 6-point Likert scale ranging from "never" to "always," with higher scores indicating better sleep hygiene practices. The tool provides a comprehensive total score as well as subscale scores for detailed analysis. The ASHS has been widely used in adolescent sleep research, demonstrating strong internal consistency (Cronbach's $\alpha > 0.80$) and test-retest reliability. Its validity has been supported in various studies by associations with sleep quality, duration, and psychological functioning in youth (Alijanzadeh et al., 2023; Chehri et al., 2023).

2.3. Intervention

2.3.1. Digital Detox Program

The digital detox program implemented in this study was designed to help adolescents reduce excessive screen time and improve their sleep hygiene through psychoeducation, behavioral techniques, and lifestyle modifications. The intervention consisted of ten structured 60-minute sessions held weekly over a ten-week period. Each session included interactive discussions, group activities, individual reflection, and goal-setting, with the guidance of a trained facilitator. The program was grounded in cognitive-behavioral principles and included elements of mindfulness, time management, and sleep education. Homework assignments and digital usage tracking were provided throughout the program to support behavioral change and reinforce learning.

Session 1: Introduction and Goal Setting

The first session introduced the participants to the concept of digital detox and the objectives of the program.

The facilitator discussed the impact of excessive screen time on physical and mental health, particularly sleep quality. Participants were encouraged to share their current digital habits and reflect on the role of screens in their daily lives. The session concluded with the establishment of individual goals for reducing screen time and improving sleep hygiene, which would be revisited and refined throughout the program.

Session 2: Understanding Screen Time Habits

This session focused on identifying personal screen time patterns and triggers. Participants completed a digital use diary to track the duration and purpose of their screen activities. The facilitator guided the group in recognizing problematic usage patterns, such as late-night screen exposure or habitual scrolling. Discussions emphasized the difference between necessary and recreational screen use. Participants set specific, measurable goals to reduce screen use in one targeted area of their daily routine.

Session 3: Sleep Hygiene Education

Participants were introduced to the concept of sleep hygiene and its significance for adolescent health. The facilitator presented the physiological and psychological processes of sleep, explaining how screen exposure, especially at night, interferes with circadian rhythms. The session included strategies for promoting good sleep habits, such as maintaining consistent sleep schedules, creating a restful bedroom environment, and avoiding caffeine and screens before bedtime.

Session 4: Managing Screen Triggers and Urges

This session addressed psychological and situational triggers that lead to excessive screen use. Through group discussions and role-playing, participants explored emotional and environmental cues that prompt them to reach for their devices. The facilitator introduced cognitive-behavioral techniques such as thought-stopping, stimulus control, and coping statements to help manage digital cravings. Participants practiced applying these techniques to real-life scenarios.

Session 5: Time Management and Scheduling

Effective time management was the focus of this session. Participants learned how unstructured time often leads to excessive screen use and poor sleep routines. The facilitator introduced tools like time-blocking, daily planners, and prioritization strategies to help participants structure their day. Each adolescent created a personalized weekly schedule balancing academic tasks, screen-free leisure activities, and sleep routines.

Session 6: Introducing Screen-Free Activities

To support healthy lifestyle changes, this session encouraged participants to explore alternatives to screen-based entertainment. The facilitator introduced a variety of engaging, screen-free options such as physical exercise, hobbies, social activities, and mindfulness practices. Participants shared their interests and brainstormed ways to integrate these activities into their routines. Each was tasked with selecting and trying out at least one new screen-free activity over the following week.

Session 7: Family and Social Support

Recognizing the role of social and familial influences, this session explored how family norms and peer behaviors affect digital habits. Participants discussed strategies for communicating their detox goals with family members and enlisting their support. Role-play exercises helped them practice setting boundaries with peers around screen use. Parents were also invited to participate in a brief informational segment to promote consistency at home.

Session 8: Reducing Nighttime Screen Exposure

This session targeted screen behaviors that directly disrupt sleep. Participants learned about the effects of blue light and the importance of a digital curfew. Strategies such as device curfews, night mode settings, and placing devices outside the bedroom were discussed. The group collaborated on creating individualized nighttime routines aimed at improving sleep hygiene and promoting screen-free wind-down periods.

Session 9: Progress Review and Relapse Prevention

Participants reviewed their progress toward the goals set at the beginning of the program. The facilitator led a discussion on common setbacks and barriers encountered, and strategies to manage relapses were explored. Cognitive restructuring techniques were introduced to help adolescents maintain long-term behavior change. Participants created a digital detox relapse-prevention plan to guide their habits after the program's conclusion.

Session 10: Final Reflection and Future Planning

The final session provided space for reflection and consolidation. Participants shared personal insights, achievements, and ongoing challenges. The facilitator facilitated a discussion on sustaining healthy digital habits and integrating what they learned into everyday life. Certificates of participation were awarded, and the session concluded with a group celebration of commitment and growth throughout the ten-week journey.

2.4. Data Analysis

Data were analyzed using analysis of variance with repeated measurements to examine the changes in screen time and sleep hygiene scores across three time points: pre-intervention, post-intervention, and five-month follow-up. The Bonferroni post-hoc test was used to identify significant pairwise differences between time points within and between the groups. Statistical analysis was performed using SPSS version 27, with a significance level set at $p < 0.05$. The analysis focused on interaction effects between time and group to determine the effectiveness of the digital detox program in producing sustained behavioral changes.

3. Findings and Results

The sample consisted of 30 adolescents aged between 13 and 17 years. Among them, 17 participants (56.7%) were female and 13 participants (43.3%) were male. In terms of age distribution, 6 participants (20.0%) were 13 years old, 7 participants (23.3%) were 14 years old, 8 participants (26.7%) were 15 years old, 5 participants (16.7%) were 16 years old, and 4 participants (13.3%) were 17 years old. Regarding academic grade level, 10 participants (33.3%) were in the 7th grade, 11 participants (36.7%) were in the 8th grade, and 9 participants (30.0%) were in the 9th grade. All participants reported having personal access to at least one digital device, and 28 participants (93.3%) reported daily screen use exceeding 4 hours.

Table 1

Descriptive Statistics for Screen Time and Sleep Hygiene Across Time and Groups

Variable	Group	Pre-Test (M ± SD)	Post-Test (M ± SD)	Follow-Up (M ± SD)
Screen Time (hrs/day)	Experimental	6.82 ± 0.76	4.31 ± 0.65	4.07 ± 0.61
Screen Time (hrs/day)	Control	6.71 ± 0.79	6.53 ± 0.72	6.48 ± 0.68
Sleep Hygiene (Total Score)	Experimental	81.27 ± 6.24	93.18 ± 5.77	92.46 ± 5.51
Sleep Hygiene (Total Score)	Control	80.84 ± 6.38	81.79 ± 6.10	81.65 ± 6.04

The descriptive statistics indicate that participants in the experimental group experienced substantial improvements

in both screen time and sleep hygiene scores across time points. Mean daily screen time decreased from 6.82 hours

(SD = 0.76) at pre-test to 4.31 hours (SD = 0.65) post-intervention, and remained low at follow-up (M = 4.07, SD = 0.61). Sleep hygiene scores in this group improved from 81.27 (SD = 6.24) to 93.18 (SD = 5.77) post-test and were maintained at 92.46 (SD = 5.51) at follow-up. In contrast, the control group showed only negligible changes in both variables across time (Table 1).

Prior to conducting the repeated measures ANOVA, all relevant statistical assumptions were examined and confirmed. The assumption of normality was assessed using the Shapiro-Wilk test, which indicated no significant

deviation from normal distribution for screen time ($W = 0.972$, $p = 0.487$) and sleep hygiene scores ($W = 0.968$, $p = 0.413$) at baseline. Mauchly's test of sphericity was applied to check the assumption of sphericity for repeated measures; the result was not significant for both screen time ($\chi^2(2) = 3.114$, $p = 0.211$) and sleep hygiene ($\chi^2(2) = 2.846$, $p = 0.241$), indicating that the assumption was met. Levene's test confirmed homogeneity of variance across groups for both variables at all time points (all $p > 0.05$). These results supported the use of repeated measures ANOVA for the main analysis.

Table 2

Repeated Measures ANOVA for Screen Time and Sleep Hygiene

Variable	Source	SS	df	MS	F	p-value	η^2 (Effect Size)
Screen Time	Time	54.93	2	27.47	51.38	<.001	.65
	Group	68.24	1	68.24	127.51	<.001	.70
	Time \times Group	59.86	2	29.93	55.95	<.001	.67
	Error (within)	29.00	56	0.52			
Sleep Hygiene	Time	714.21	2	357.11	34.76	<.001	.55
	Group	826.67	1	826.67	80.45	<.001	.60
	Time \times Group	639.82	2	319.91	31.13	<.001	.53
	Error (within)	575.38	56	10.27			

The repeated measures ANOVA showed significant main effects of time and group, and a significant interaction between time and group for both screen time and sleep hygiene. For screen time, the time \times group interaction was significant ($F(2,56) = 55.95$, $p < .001$, $\eta^2 = .67$), indicating that the change over time differed significantly between the

experimental and control groups. A similar pattern was found for sleep hygiene, where the interaction was also significant ($F(2,56) = 31.13$, $p < .001$, $\eta^2 = .53$), confirming the program's positive effect on sleep-related behavior (Table 2).

Table 3

Bonferroni Post-Hoc Test for Screen Time and Sleep Hygiene (Experimental Group)

Variable	Comparison	Mean Difference	SE	p-value
Screen Time	Pre-Test vs Post-Test	2.51	0.21	<.001
	Pre-Test vs Follow-Up	2.75	0.23	<.001
	Post-Test vs Follow-Up	0.24	0.19	.238
Sleep Hygiene	Pre-Test vs Post-Test	-11.91	1.40	<.001
	Pre-Test vs Follow-Up	-11.19	1.52	<.001
	Post-Test vs Follow-Up	0.72	1.28	.572

The Bonferroni post-hoc comparisons revealed significant reductions in screen time from pre-test to post-test (Mean Difference = 2.51, $p < .001$) and from pre-test to follow-up (Mean Difference = 2.75, $p < .001$) in the experimental group. However, the difference between post-test and follow-up was not statistically significant ($p = .238$), indicating stability in reduced screen time. Similar trends were observed for sleep hygiene, with significant improvements from pre-test to post-test (Mean Difference =

-11.91, $p < .001$) and pre-test to follow-up (Mean Difference = -11.19, $p < .001$), while the post-test and follow-up scores remained statistically stable ($p = .572$) (Table 3).

4. Discussion and Conclusion

The findings of this randomized controlled trial provide compelling evidence that a structured digital detox program can effectively reduce screen time and improve sleep

hygiene among Chinese adolescents. Participants in the intervention group demonstrated a statistically significant decrease in their daily screen time and a corresponding improvement in sleep hygiene scores both immediately following the ten-week program and at the five-month follow-up assessment. In contrast, the control group's screen time remained relatively stable throughout the same period, with minimal improvement in sleep hygiene. Notably, these results indicate sustained benefits of the intervention, suggesting that adolescents can internalize and maintain healthier technology habits when provided with structured support, psychoeducation, and ongoing goal-setting.

One of the most salient outcomes is the substantial drop in total screen time within the experimental group. At baseline, participants in both groups reported average usage exceeding four hours per day, aligning with broader patterns of adolescent technology immersion in high-pressure academic environments (Lee & Cho, 2023; Xu et al., 2024). After the ten-week digital detox program, the intervention group's average daily usage decreased by approximately 30%, and the reduced level of screen exposure was still evident five months later. These data coincide with earlier indications that interventions that combine behavioral guidelines, social support, and self-monitoring can significantly curtail problematic technology consumption (Beluli, 2023; Hale & Dzierzewski, 2024; Zain & Hanif, 2023). The fact that the effect was preserved over a relatively long follow-up period underscores the importance of equipping adolescents with sustainable strategies rather than just short-term behavior modification.

The observed improvements in sleep hygiene within the experimental group further reinforce the positive influence of mitigating device overuse. Participants in the digital detox program reported better bedtime routines, less delayed sleep onset, and fewer occurrences of nighttime digital engagement. These findings are consistent with prior research suggesting that high screen exposure, particularly near bedtime, can disrupt circadian rhythms, impair sleep quality, and increase the likelihood of delayed sleep-phase patterns (G et al., 2024; Hale et al., 2024; Rowland, 2023). When adolescents are exposed to stimulating content or bright screens during the evening, melatonin secretion is suppressed, thereby delaying sleep onset and reducing overall sleep duration (Huang et al., 2023; Lee & Cho, 2023). By restricting technology use and implementing routines that prioritize screen-free hours before bed, the intervention likely alleviated these physiological disruptions and encouraged better general sleep practices.

The digital detox program employed in this study integrated multiple strategies—psychoeducation on the links between screens and sleep, cognitive-behavioral techniques to manage digital triggers, and structured goal-setting with consistent follow-up. This multifaceted approach may help explain the intervention's success. In line with previous studies, comprehensive, behaviorally anchored interventions tend to outperform singular, didactic educational programs in producing meaningful and lasting lifestyle changes (Azzahrah, 2025; Hale & Dzierzewski, 2024; Maulida et al., 2024). Moreover, the program encouraged participants to identify alternative, non-screen-based activities that could replace excessive technology use. These substitutions, such as physical exercise, mindfulness practice, or social interaction, not only reduce the time allocated to digital devices but also foster positive habits that indirectly promote sleep quality (Coel et al., 2022; G et al., 2024; Saeed et al., 2024).

It is also notable that the self-reported improvements in sleep hygiene encompassed more than just device usage patterns. Participants in the experimental group reported better consistency in bedtimes, greater awareness of environmental factors conducive to sound sleep, and decreased bedtime procrastination. Such advances highlight the importance of embedding digital use reduction strategies within broader frameworks of sleep education. Adolescents, who face unique biological and psychosocial sleep challenges, often benefit from interventions that address both lifestyle issues and specific sleep-related knowledge gaps (Nguyen et al., 2024; Richards & Gutter, 2023; Saminthaapunya & Choksamut, 2023). Programs that fuse digital device management with practical guidance on bedtime routines, nutrition, and stress management appear particularly well-suited to the diverse pressures faced by teenagers in high-expectation educational systems (D. & R., 2023; Hale et al., 2024; Xu et al., 2024).

Examining these results in the broader context of adolescent health reveals a consistent pattern: excessive digital media usage and suboptimal sleep are intimately interlinked (Huang et al., 2023; Kushwaha et al., 2024; Pchelina et al., 2022). Sleep disruptions precipitated by late-night technology use can have wide-ranging consequences, from heightened daytime fatigue and impaired academic performance to increased risk of mood disturbances and physical health concerns (Bolshakova et al., 2024; Dzierzewski et al., 2024; Rowland, 2023). This trial's demonstration of reduced screen time and improved sleep hygiene thus touches upon a critical element of well-being

for adolescents. Previous research has highlighted that interventions aiming at one domain—either digital behavior or sleep patterns—often generate spillover benefits in other areas, underscoring the need for integrated health promotion efforts (Arnardóttir & Cunningham, 2023; Beluli, 2023; Hale & Dzierzewski, 2024).

Another significant finding is the strong engagement and adherence observed among participants. From anecdotal feedback reported during sessions, adolescents responded positively to a structured approach that allowed them to set personal goals, track progress, and discuss challenges within a supportive group context. Many participants expressed appreciation for learning practical ways to cope with digital temptations, such as adjusting device notifications, setting device-free zones, and soliciting family support for consistent household rules. This resonates with earlier investigations into technology cessation or reduction programs, which identify social accountability and skill-based strategies as pivotal for bridging the gap between awareness and action (Schouwenaars, 2023a, 2023b; Zain & Hanif, 2023). By offering a combination of psychoeducational content and real-world applications, the intervention capitalized on personal motivation and peer reinforcement—two factors known to significantly shape adolescent health behaviors (Coel et al., 2022; G et al., 2024; Wickham et al., 2024).

Interestingly, the digital detox program's positive outcomes also reflect an underlying dynamic relevant to Chinese youth in particular. The academic culture in China often places considerable pressure on adolescents, potentially compelling them to use their limited free time in digitally mediated relaxation, socializing, or online academic resources (Huang et al., 2023; Lee & Cho, 2023; Xu et al., 2024). By actively managing their screen use, the intervention group may have developed a more deliberate approach to recreation, allocating time to in-person social interactions, restful physical activities, or preparatory bedtime routines. These modified habits seem to enhance both mental decompression and physiological readiness for sleep. Furthermore, the group-based nature of this program might have counterbalanced the isolation or stress some adolescents experience when preparing for major exams, replacing solo screen time with community-based support—a crucial element in sustaining behavioral change (Dzierzewski et al., 2024; Saeed et al., 2024; Samintharapunya & Choksamut, 2023).

Despite the robust findings observed, it remains important to acknowledge the variability in response among

participants. A subset of individuals in the experimental group showed less pronounced improvements, suggesting that personal traits, family environments, or underlying mental health conditions may influence the effectiveness of digital detox programs (Azzahrah, 2025; Nguyen et al., 2024; Richards & Gutter, 2023). Adolescents with strong internal motivation to control screen use might benefit more quickly than those whose digital habits serve as primary outlets for coping with stress or emotional challenges. In line with prior research, addressing co-occurring behavioral or psychological issues may be crucial to fully realizing the potential of interventions targeting screen use and sleep hygiene (Beluli, 2023; Hale et al., 2024; Maulida et al., 2024). Nonetheless, the overall trends indicate that, for most participants, a well-structured digital detox program can yield marked benefits that are sustained beyond the immediate post-intervention phase.

In sum, the results suggest that integrating a digital detox framework with psychoeducation and behavioral strategies offers a viable and potent means of addressing excessive screen use and poor sleep hygiene in adolescents. The sustained improvements revealed at the five-month follow-up illustrate that concerted efforts to limit device use and foster better sleep practices can lead to enduring changes. These findings dovetail with earlier scholarship linking reductions in screen time to robust improvements in mental health, academic functioning, and overall quality of life (Hale & Dzierzewski, 2024; Kushwaha et al., 2024; Toprak & Karan, 2022). While there remains considerable work to be done to adapt and refine digital detox interventions for diverse cultural contexts, this study adds to the growing body of evidence that purposeful, skill-based programs can effectively recalibrate adolescents' digital habits and support healthier developmental trajectories.

5. Limitations & Suggestions

Although the results of this study are promising, several limitations should be considered. First, the sample size was relatively small, involving only 30 participants, which limits the generalizability of the findings. Second, reliance on self-reported screen time and sleep hygiene measures may introduce reporting biases or inaccuracies. While participants were encouraged to be honest and thorough, objective measures (such as actigraphy or device usage logs) might produce more precise estimates of changes in behavior. Third, the voluntary nature of participation might have introduced selection bias, as adolescents particularly

concerned about their screen use or sleep problems may have been more motivated to enroll. Fourth, the intervention was conducted in a single urban region of China, and cultural factors or regional variances could affect replication in other contexts or populations.

Future investigations should consider larger samples from diverse geographical and cultural settings to establish stronger external validity and to explore how local norms or parental expectations influence intervention effectiveness. Employing objective measurements of screen time, such as device-tracking applications, can mitigate reporting biases and improve data accuracy. Additionally, incorporating physiological sleep assessments (e.g., actigraphic measurements or polysomnography) can reveal more nuanced insights into how reducing digital engagement modulates sleep architecture. Research might also investigate how individual factors such as personality traits, mental health status, or academic pressures mediate the outcomes of digital detox programs. Longitudinal studies spanning multiple years, rather than months, would clarify whether observed benefits persist across critical developmental transitions, such as entry into higher education or the workforce.

Adopting a multi-pronged approach that encompasses psychoeducation, behavioral techniques, and environmental modifications can facilitate the successful implementation of digital detox interventions in school-based and community settings. Practitioners should tailor program content to accommodate cultural values, academic schedules, and social pressures specific to the adolescent population they serve. Cultivating an atmosphere of peer and family support is essential for reinforcing new habits and building accountability networks that endure beyond the formal program period. Schools, healthcare providers, and policymakers can collaborate to embed these interventions within broader wellness initiatives aimed at promoting balanced digital use, fostering positive social connections, and enhancing youth resilience.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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