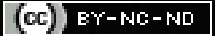


Strategies for Enhancing Impulse Control among Adolescents: A Narrative Review

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ABSTRACT

Adolescent growth depends on impulse control, which impacts wellbeing, social interactions and academic achievement. The purpose of this narrative review is to assess the efficacy of therapeutic and educational initiatives aimed at enhancing impulse control during this crucial developmental phase. The review highlights various successful interventions that can be used to improve impulse control in adolescents. These interventions include self-regulation strategies, serious games, mindfulness practices, cognitive-behavioural approaches and biopsychosocial workshops. To support comprehensive adolescent development, future research should focus on long-term outcomes and the integration of these interventions into broader educational and therapeutic frameworks.

Keywords: Biopsychosocial workshops, Cognitive-behavioural training, Mindfulness, Self-regulation

INTRODUCTION

Impulse control is a crucial aspect of adolescent development that significantly impacts academic performance, social relationships, and overall wellbeing [1]. Adolescence, a period marked by rapid cognitive and emotional changes, often poses challenges to effective impulse control, which is essential for making reasoned decisions and managing behaviours [2]. Poor impulse control during adolescence has been linked to a range of negative outcomes, including academic underachievement, substance abuse, and mental health disorders [3,4]. The influence of academic pressure and associated stressors, such as parent-child conflict and reduced subjective wellbeing, further complicates impulse control during this stage of life [1]. Additionally, distinct brain networks have been identified that underlie various impulsivity phenotypes in adolescents, highlighting the complexity of the issue [4].

Educational and clinical interventions to improve adolescent impulse control have gained increasing attention. Cognitive Behavioural Training (CBT) is one of the most widely studied approaches. It involves cognitive restructuring and behavioural rehearsal to help adolescents develop better problem-solving skills and manage impulsive behaviours [5]. CBT can significantly improve both the emotional and behavioural aspects of impulse control, making it a comprehensive intervention [6]. The potential of mindfulness therapies to improve impulse control has also been investigated. Using strategies like focused attention and emotional management, mindfulness practices aim to enhance awareness and self-regulation [7]. Based on published systematic reviews, these therapies have demonstrated promising results in lowering symptoms of Attention Deficit Hyperactivity Disorder (ADHD) and enhancing impulse control in both clinical and educational contexts [8,9]. The successful application of mindfulness-based therapies in educational settings has shown notable improvements in students' ability to regulate their behaviour [9].

Serious games are one example of an innovative strategy that has emerged as an effective way to help adolescents acquire cognitive control. Serious games improve cognitive abilities such as attention and inhibitory control through engaging and entertaining exercises. Hence, playing these games can enhance impulse control [10]. Self-regulation strategies, including goal-setting, monitoring, and self-reinforcement, empower adolescents to actively control their behaviours. These strategies have been associated with improved self-discipline and goal attainment, making them effective in promoting impulse control [11].

The biological, psychological, and social aspects of impulsivity are integrated into biopsychosocial workshops, which provide a comprehensive framework for managing impulsive behaviours and addressing the complex factors influencing teenage behaviour [12]. This holistic approach to impulsivity management is presented here. With the goal of improving adolescents' impulse control, this narrative review attempts to critically summarise the most recent research on a variety of therapeutic and pedagogical approaches. To provide a thorough understanding of the impact and applicability of various strategies in promoting adolescent development, the review assesses the efficacy of self-regulation techniques, serious games, CBT, mindfulness practices, and biopsychosocial workshops.

LITERATURE SEARCH

A comprehensive search was conducted across multiple electronic databases, including PubMed, PsycINFO, ERIC, Scopus, Web of Science, and Google Scholar. The search terms used were "impulse control," "adolescents," "cognitive behavioural therapy," "mindfulness," "serious games," "self-regulation," "biopsychosocial interventions," "behavioural modification," "emotional regulation," and "executive function training." Boolean operators were employed to refine the search strategy, using combinations such as ("impulse control" OR "self-regulation") AND ("adolescents" OR "teenagers") AND ("interventions" OR "therapy" OR "training") AND ("cognitive-behavioural therapy" OR "mindfulness" OR "serious games"). Searches were limited to journal articles written in English from January 1980 to May 2023.

Inclusion criteria: Studies were included in this systematic review based on the following criteria:

1. Adolescents aged 12-18 years, as this developmental period is critical for the maturation of impulse control.
2. Educational or clinical interventions specifically designed to improve impulse control in adolescents, ensuring that the interventions were directly relevant to the research question.
3. Only studies reporting measurable outcomes related to impulse control were included.

Data extraction: Data extraction was independently conducted by two reviewers, to ensure consistency and reduce bias. Any discrepancies between the reviewers were resolved through discussion or, when necessary, by consulting a third reviewer to reach a consensus. A standardised extraction form was used to

capture key elements such as author names, year of publication, types of intervention, sample size, and reported outcome measures.

DISCUSSION

The CBT is a popular method shown to enhance mood regulation and impulse control by using cognitive restructuring and behavioural activation techniques [13,14]. Mindfulness-based interventions, which include practices like meditation and yoga, have also played a significant role. Research indicates that these techniques improve the ability to manage emotions and control impulses, especially in teenagers with ADHD [7,15]. Moreover, creative approaches such as serious games have demonstrated potential in enhancing cognitive control and self-discipline. These games provide interactive activities that focus on attention and response inhibition, which are important for controlling impulsive behaviours [10,16].

Goal-setting and self-monitoring are two examples of self-regulation techniques that equip teenagers with useful tools for effectively managing their behaviour [17]. The integration of these various techniques provides a comprehensive framework for managing impulsivity and promoting improved impulse control during adolescence. This underscores the importance of using a multimodal approach to address impulse control issues and enhance adolescents' overall wellbeing. Self-control methods, such as setting goals and monitoring oneself, offer practical strategies for teenagers to efficiently regulate their actions [17].

The review highlight the effectiveness of various interventions in helping adolescents better control their impulses and regulate their emotions. The role of CBT in improving impulse control is emphasised in [Table/Fig-1], particularly for youth with mood disorders or criminal behaviour [13,14]. CBT therapies incorporate cognitive restructuring, behavioural activation strategies, and social problem-solving. The outcomes consistently showed notable improvements in mood regulation, problem-solving abilities, and impulse control, demonstrating the effectiveness of CBT in assisting teenagers in developing healthier coping strategies and positive behavioural changes.

The effect of mindfulness therapies on emotional regulation is shown in [Table/Fig-2] [15,18]. In addition to structured mindfulness techniques, these interventions included yoga, breathing techniques, and mindful eating programs. The results demonstrated significant gains in controlling impulsive actions, regulating emotions generally, and managing symptoms of ADHD. This illustrates how effectively mindfulness can help teenagers better manage their emotions and impulses, thereby improving their mental health.

The efficacy of novel self-regulation techniques, especially computerised training programs, in enhancing impulse control is highlighted in [Table/Fig-3] [16,17,19]. Research findings indicate noteworthy improvements in teenagers' response inhibition, cognitive control, and self-discipline. These findings imply that combining technology with tailored feedback can enhance self-regulation

Study	Sample size	Intervention type	Key components of CBT	Measured outcomes	Results
Hains AA and Hains AH (1988) [13]	Delinquent adolescents (N=5), aged 15-17 years	CBT	Social problem-solving strategies Self-instructional techniques Alternating-treatments procedure	Improvement in social problem-solving skills Impulse control Generalisation of cognitive strategies, Behavioural changes within institutional settings	Most youths showed improvement in problem-solving and impulse control skills Some participants demonstrated the ability to transfer skills to new situations Follow-up data indicated maintenance of gain potential behavioural changes identified within institutional settings
Defayette AB et al., (2021) [14]	110 adolescents with mood disorders, aged 13-18 years	CBT	Cognitive restructuring behavioural activation problem-solving emotional regulation relaxation techniques	Symptoms of depression and anxiety Coping skills Self-reported mood	Significant reduction in depressive and anxiety symptoms Improved coping skills Positive impact on mood stability

[Table/Fig-1]: Cognitive-Behavioural Training (CBT) and impulse control in adolescents [13,14].

Study	Study population type	Mindfulness technique	Duration of intervention	Measured outcomes	Results
Virone ML (2023) [15]	Middle school students	Formal mindfulness practices Informal mindfulness practices	Six weeks	ADHD symptoms Frequency of external cues to identify negative symptoms Ability to implement mindfulness techniques during negative symptoms Understanding of mindfulness	Improvement in ADHD symptoms Reduction in the frequency of external cues needed Enhanced ability to use mindfulness techniques during negative symptom events Better understanding of mindfulness
Ghahremani DG et al., (2013) [18]	High school students (ages 14-18 years)	Youth Empowerment Seminar (YES) program including yoga, mindful eating, breathing exercises (Sudarshan Kriya), and mindfulness techniques	Four weeks (about 1 hour per day, totaling ~20 hours)	Impulsive behaviour measured using a 20-item version of the Barratt Impulsiveness Scale (BIS-11)	Significant reduction in impulsive behaviour in the YES group compared to the control group, especially in total impulsiveness and the non planning subscale. Marginal increases in impulsiveness in the control group in the motor subscale.

[Table/Fig-2]: Mindfulness interventions and emotional regulation in adolescents [15,18].

Study	Study population type	Innovative strategy	Core components	Measured outcomes	Results
Boendermaker WJ et al., (2017) [16]	185 adolescents (13-17 years)	Computerised training programs to enhance impulse control	Stop-Signal and Go/No-Go tasks for training response inhibition Interactive tasks designed to improve cognitive control Personalised feedback to manage impulsive behaviours	Improvement in response inhibition Enhanced cognitive control Reduction in impulsivity	Significant improvement in behaviour control in adolescents Positive changes in response inhibition and cognitive control
Duckworth AL et al., (2011) [17]	Adolescents (N=66)	Self-regulation strategies	Mental contrasting, Implementation intentions	Self-discipline, Goal attainment	Improved self-discipline
Grandjean A et al., (2022) [19]	Adolescents with Attention Deficit Hyperactivity Disorder (ADHD)	Cognitive Behavioural Therapy (CBT)	Attentional and metacognitive workshops (90 minutes per week for 12 weeks)	Impulsive control (measured using the Simon reaction time task)	Improved impulsive control, with decreased impulsive actions and enhanced inhibitory processes efficiency

[Table/Fig-3]: Innovative and self-regulation strategies for enhancing impulse control in adolescents [16,17,19].

and impulse control. In general, during this critical developmental period, adolescents can benefit significantly from the use of CBT, mindfulness, and creative methods to help them develop healthier behavioural patterns and emotional resilience.

These tables highlight how different educational and clinical approaches can boost impulse control in teenagers. These interventions provide unique mechanisms and advantages that, when combined, can create holistic programs to support adolescent growth. CBT is regarded as a highly effective method for enhancing impulse regulation. Hains AA and Hains AH emphasised that CBT is essential for controlling impulsive behaviours through cognitive restructuring and behavioural rehearsal [13]. Although their research had a small scope, it showed that CBT could greatly improve problem-solving abilities and impulse management, indicating its potential for wider application.

Additionally, Defayette AB et al., conducted a comprehensive investigation with 110 teenagers, demonstrating that CBT not only enhanced impulse management but also reduced depressive symptoms [14]. CBT is a robust intervention that targets both the emotional and behavioural aspects of impulsivity, offering dual benefits. Mindfulness-based interventions have also shown significant potential in decreasing impulsivity. Virone ML found that engaging in mindfulness exercises resulted in notable decreases in ADHD symptoms and improvements in impulse regulation [15]. Mindfulness practices, such as meditation and attention training, help teenagers cultivate increased self-awareness and self-control, which are essential for managing impulsive actions. Engaging in these practices promotes a greater level of mindfulness regarding one's thoughts and behaviours, leading to improved impulse management. Serious games offer a new method for enhancing cognitive control and impulse regulation. Boendermaker WJ et al., investigated how serious games could improve impulse control using interactive and engaging approaches [16]. Their research indicated that these games may be helpful in enhancing cognitive functions like attention and inhibitory control, although they did not mention the sample sizes. This new approach provides a lively and engaging method to tackle impulsivity, supplementing conventional techniques.

Self-control techniques have been shown to be effective in improving impulse management in teenagers. Duckworth AL et al., conducted research involving 66 teenagers to demonstrate how setting goals, monitoring progress, and using self-reward strategies can enhance self-control and the achievement of objectives. These techniques help teenagers take control of their behaviour by encouraging a proactive mindset [17]. Adolescents can improve self-control and develop disciplined, goal-directed behaviour by establishing specific objectives, tracking their progress, and encouraging positive actions.

Moreover, there has been a rise in biopsychosocial workshops as a comprehensive method for managing impulsive behaviours. Research conducted by Ghahremani DG et al., highlighted the effectiveness of these workshops in decreasing impulsivity [18]. Biopsychosocial workshops consider the interaction of biological, psychological, and social factors in impulsivity, unlike methods that focus on only one aspect. This thorough plan addresses both the immediate symptoms of impulsive behaviour and the underlying factors, such as genetic predispositions, emotional regulation, and social influences. By combining different elements, biopsychosocial workshops provide a comprehensive approach in improving impulse control, making them valuable components of larger intervention programs.

The findings of this narrative review corroborate prior studies that emphasised the value of psychosocial variables and complementary therapies in helping teens improve their impulse control. Carvalho CB et al., highlighted that managing emotions, parental attachment, and social group attachment play an important role in reducing impulsivity and its related dangers [20]. This research supports

the review's emphasis on holistic strategies by underscoring the significance of these psychosocial factors in decreasing impulsive actions and improving overall self-control. Grandjean A et al., suggest that CBT may be a beneficial option for enhancing impulse control in teenagers with ADHD, serving as an alternative to stimulant medications [19]. Their discovery of improved impulsivity management through CBT underscores the review's analysis of the efficacy of different therapeutic approaches. Both research papers contribute to our understanding of how targeted techniques, such as enhancing psychological aspects or utilising therapies, can significantly influence adolescent impulsivity [19,20].

This detailed review explores various educational and clinical techniques to improve impulse control in adolescents, emphasising key interventions such as CBT, mindfulness practices, and serious games. The review covers a wide range of topics, brings together different perspectives, and highlights the complexity of impulse control. However, it is important to recognise several constraints. The differences in study designs, sample sizes, and intervention types make it difficult to make direct comparisons and could impact the strength and applicability of the results. Moreover, potential biases and limitations in assessing long-term effectiveness arise from the inclusion of only English-language studies, brief intervention durations, and the variety of outcome measures. Future studies should aim to create consistent protocols and outcome measures, extend follow-up periods, and incorporate research in various languages to provide a comprehensive assessment of techniques for enhancing impulse control in adolescents.

CONCLUSION(S)

This review demonstrates how different educational and clinical methods can improve impulse control in teenagers. CBT, mindfulness interventions, serious games, self-regulation strategies, and biopsychosocial workshops all offer potential ways to enhance impulse control through various approaches. The results indicate that cognitive-behavioural methods can modify thought processes and actions, whereas mindfulness techniques improve self-awareness and emotional regulation. Serious games provide interactive ways to enhance cognitive control, while self-regulation strategies help achieve discipline and reach goals. Biopsychosocial workshops take a comprehensive approach, considering various factors that contribute to impulsivity. Although study designs and sample sizes vary, the successful outcomes from these different interventions demonstrate their potential for integration into educational and clinical programs to support adolescent development.

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