



(REVIEW ARTICLE)



Executive functions, self-regulation and social media for peace-based inclusive education

Vana Gkora * and Antonios I. Christou

Department of Special Education, University of Thessaly, Volos, Greece.

Magna Scientia Advanced Research and Reviews, 2023, 08(02), 129–140

Publication history: Received on 23 June 2023; revised on 09 August 2023; accepted on 11 August 2023

Article DOI: <https://doi.org/10.30574/msarr.2023.8.2.0116>

Abstract

This article comprehensively explores the critical interplay between executive functions (EFs), self-regulation, and social media in promoting a peaceful and inclusive educational environment. The study emphasizes the significance of EFs in regulating cognitive processes and coping with new challenges, focusing on the prefrontal cortex (PFC) and its interconnected neural circuits. Addressing the relevance of EFs in conflict resolution, emotional regulation, and metacognitive practices, the research investigates how they contribute to constructive conflict-resolution, emotional maturity, and responsible online behavior in educational settings. Furthermore, the bidirectional relationship between prosocial behaviors and EFs is explored, revealing their mutual reinforcement during early childhood and beyond. The article discusses the benefits and challenges of social media in educational contexts, highlighting the importance of mindful usage to promote positive interactions and empathy among students, educators, and stakeholders. Adopting a holistic approach, the study examines successful self-regulation practices and approaches that empower individuals to navigate negative emotions and cultivate positive relationships within groups. Additionally, the review sheds light on the potential implications of EFs and self-regulation in neurodevelopmental disorders, such as autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). It identifies shared genetic bases and neurobiological underpinnings, offering valuable insights for developing targeted interventions to enhance executive function skills in affected populations. The findings have practical implications for professionals in education, parents, and policymakers, emphasizing the importance of nurturing emotional regulation, promoting metacognitive practices, and ensuring responsible social media use to create a harmonious and inclusive educational environment. The article aims to provide valuable insights for researchers and practitioners seeking to cultivate empathy, support positive conflict resolution, and facilitate the holistic development of students and stakeholders in educational and intimate learning environments.

Keywords: Executive Functions; Self-Regulation; Conflict Resolution; Soft Skills; Inclusive Education; Social media; Conflict Resolution; Emotional Regulation; Metacognitive Practices.

1 Introduction

Creating a peaceful and inclusive atmosphere is paramount for students' academic, social, and emotional well-being in educational environments [1]. Educational settings strive to accommodate all students' diverse needs, desires, and values, but conflicts may arise due to differences in communication skills and individual perspectives [2]. Conflict resolution hinges on the capacity to effectively manage negative emotions, a hallmark of emotional maturity, which indicates attaining self-control. [3] Therefore, effective conflict resolution strategies are crucial for fostering a peaceful and inclusive atmosphere in educational settings. Addressing conflicts, particularly in education, necessitates promoting self-regulation skills among all individuals involved. Self-regulation involves consciously navigating cognitive and socio-emotional conflicts, relying on executive functions such as attention. Research by Diamond [4] and

* Corresponding author: Vana Gkora

Petersen & Posner [5] underscores the intertwined nature of self-regulation, executive functions, and attention. The interweaved nature of self-regulation, executive functions, and attention highlights the crucial role of metacognitive executive functions in supporting cognitive control mechanisms [6]. These metacognitive executive functions, which encompass attention, self-monitoring, working memory capacity, inhibitory control, and task switching, are interrelated functions that affect an individual's cognitive control mechanism [6]. Failure to develop and apply self-regulation skills can lead to the manifestation of antisocial behaviors [7]. However, individuals who effectively regulate negative emotions and demonstrate emotional maturity through self-control can adeptly resolve conflicts and establish positive relationships within a group [7]. Moreover, self-regulation empowers individuals to overcome stereotypes and conquer their fear of conforming to negative beliefs others hold [7].

In the educational context, teachers regularly encounter numerous cases of emotional and behavioral difficulties/disorders (EBDs) among their students. These challenges come in various forms and can make it challenging for students to adapt to the demands of school life [1]. The situation worsens when teachers react aggressively toward students with behavioral issues and resort to harsh disciplinary measures. Such interactions can even disrupt the relationships between students and their peers, leading to feelings of rejection and marginalization [1]. Similarly, a prevalent trait in individuals with ASD is underdeveloped self-management skills, which manifest as challenges in presenting, controlling, and maintaining behaviors necessary for adhering to the class routine [8]

Executive function encompasses a set of cognitive abilities that involve controlling attention, mental flexibility, goal-directed behavior, and the capacity to anticipate the outcomes of one's actions. Additionally, it includes the concept of self-awareness and acknowledges the frontal lobes' role as managers and programmers of human psychological processes, called metacognition [9]. Drigas and Karyotaki [6] emphasized the bidirectional relationship between executive functioning and problem-solving skills, highlighting the essential cognitive and metacognitive processes involved in regulating behavior, controlling attention, and effectively resolving problems. Their research suggests that enhancing self-regulation and executive functions can significantly benefit individuals' cognitive flexibility, emotional regulation, and decision-making abilities, particularly those facing cognitive and emotional challenges. Individuals with conditions like ADHD, Autism Spectrum Disorder, Oppositional Defiant Disorder, or comorbid states like older adults and individuals with Traumatic Brain Injury (TBI) can enhance their cognitive control deficits by improving problem-solving skills [6]. The study by Mitsea, Drigas, and Skianis [10] delves into the role of metacognition in Autism Spectrum Disorder (ASD). It examines how assistive technologies can address metacognitive deficits in individuals with ASD. Using metacognitive models developed by Drigas and Mitsea in 2020 and 2021, the researchers identify promising digital technologies for training metacognitive skills in ASD individuals, including robotics, virtual reality, mobile applications, digital serious games, coding digital games, and robots.

Spencer-Smith and Klingberg [11] demonstrated that executive function training can improve behavior and attention, benefiting children and adults, regardless of whether they have ADHD. El Wafa, Ghobashy, and Hamza's [12] comparative study provided valuable insights into the executive functions of children with ADHD and those with learning disabilities (LD), shedding light on potential differences in these cognitive processes across various contexts. Toole et al. [13] explored the connections between executive function, Theory of Mind, and different forms of aggression in early childhood. This finding highlights the role of executive functions in regulating impulsive behaviors. It suggests that difficulties inhibiting impulses and delaying gratification may contribute to higher levels of physical aggression in individuals. Espino-Díaz et al. [14] added significant value to our understanding of executive functioning skills and their role in prosocial behavior across different developmental stages. Their study suggested a bidirectional relationship, indicating that fostering prosocial behaviors may contribute to the development of executive function and vice versa. Moreover, executive function emerged as a significant predictor of prosocial skills, and it played a mediating role in the relationship between positive interactions and prosocial behavior. Considering the findings from Moriguchi et al. [15], a bidirectional relationship exists between prosocial behaviors and executive function during early childhood. Engaging in prosocial behaviors in this stage can promote the development of executive function skills, while executive function, in turn, supports the expression of prosocial behaviors. Similarly, Kim et al. [16] highlighted the mediating role of executive function in positive mother-child interactions and prosocial behavior in school-aged children. Positive interactions with caregivers influence the development of executive function, contributing to the development of prosocial behavior.

This literature review explores the vital role of self-regulation and executive functioning in conflict resolution within educational environments. Additionally, we delve into the neurobiological basis of executive functions, strategies for enhancing self-regulation skills and executive functions, and present examples of successful self-regulation practices and approaches. Furthermore, we examine the role of social media in education settings, discussing the potential benefits and challenges it presents. By thoroughly investigating these key aspects, we aim to provide valuable insights

into fostering a peaceful and inclusive educational atmosphere that nurtures empathy, supports positive conflict resolution, and promotes the holistic development of all students, educators, and stakeholders.

2 Method

This study used a holistic approach to explore social media's executive functions, self-regulation, and interconnections in inclusive peace-based education, focusing on constructive conflict resolution, emotional regulation, metacognitive practices, and responsible online behavior. By adopting this approach and conducting an extensive literature review using academic databases such as Google Scholar, ResearchGate, and PubMed, we gained valuable insights into the significance of these cognitive abilities in fostering a peaceful and inclusive atmosphere in educational settings. The findings offer practical implications for educators, parents, therapists, and policymakers, underscoring the importance of promoting emotional regulation, fostering metacognitive practices, and ensuring mindful use of social media to improve overall educational experiences.

3 The Neurobiological Basis of Executive Functions

Executive functions (EF) are crucial in regulating cognitive processes, enabling goal-directed behavior, and coping with novel situations. These cognitive control processes, primarily supported by the brain's prefrontal cortex (PFC), encompass various thinking skills such as working memory, inhibitory control, and flexible attention shifting [17]. However, EFs involve a network of brain regions, including the cingulate cortex, parietal cortex, basal ganglia, amygdala, and hippocampus, working in coordination to facilitate problem-solving and reasoning abilities.

The limbic system, notably the amygdala, plays a vital role in EFs by registering emotional and motivational significance. The limbic-to-PFC circuitry establishes a feedback loop where the PFC receives input from the limbic brain and modulates it accordingly. This modulation is influenced by neurotransmitters like dopamine, norepinephrine, and cortisol, which impact neural activity in the PFC supporting executive functions. Optimal EF performance occurs when neurotransmitter levels are balanced, leading to strong PFC neural activity. However, neurotransmitter-related disruptions due to stress, overstimulation, or boredom can impair PFC activity, affecting executive functions negatively [18].

Understanding the neurobiological basis of executive functions has significant implications for neurodevelopmental disorders such as autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). Family and twin studies have supported the idea that ASD and ADHD may share a common genetic basis, with approximately 50%-72% of contributing genetic factors showing overlap in both disorders [19]. Recent genetic evidence has implicated the synaptosomal-associated protein of 25 kDa in ASD and ADHD, further supporting their potential shared etiology.

In ASD, executive dysfunction has been identified as a central deficit affecting cognitive flexibility, planning, attention shifting, and response inhibition. Numerous studies have reported impairments in these EF aspects, even in high-functioning individuals with autism [19]. Similarly, ADHD is characterized by significant deficits in various neuropsychological measures of EF, including working memory, response inhibition, and planning [20].

The review by Craig et al [18] emphasizes the importance of comparing executive functioning between ASD and ADHD to identify potential neurocognitive endophenotypes and the existence of a clinical combined phenotype (ASD + ADHD). Understanding the neurobiological underpinnings of executive functions in these disorders can offer insights into shared neural mechanisms and contribute to enhanced treatment options.

Interventions aimed at improving executive function skills in individuals with ASD and ADHD can benefit from insights into the interconnected limbic-to-PFC circuitry. Targeting neurotransmitter imbalances, reducing stress, and providing appropriate stimulation can enhance PFC neural activity, promoting optimal executive functioning.

For instance, educational strategies that consider "earlier is better" principles and ecological validity can help children with executive function challenges [17]. Providing appropriate cognitive training exercises, incorporating emotional regulation techniques, and utilizing therapies that promote self-regulation may benefit ASD and ADHD populations.

More specifically, the "earlier is better" principle advocates training executive function skills during childhood, taking advantage of rapid brain development to achieve more efficient outcomes. Early childhood neural networks are relatively less specialized, making them more receptive to the positive effects of training. Similarly, the principle of ecological validity emphasizes embedding training exercises in real-world settings, such as school and work, to ensure

that acquired skills can be easily applied to everyday situations. It is crucial that executive function training not only improves performance on specific assessments but also bolsters broader underlying mental abilities [17].

4 Strategies for Enhancing Self-Regulation Skills and Executive Functions

4.1 Early Education and Training

Training EF skills during childhood, when the prefrontal cortex and other brain areas are rapidly developing, may be more effective due to the brain's increased plasticity. The importance of incorporating EF training into everyday contexts, such as preschool and kindergarten, is to promote the generalizability of skills. Structured play approaches, such as those in Montessori education and the Tools of the Mind program, have shown promise in fostering executive function skills [17]. Similarly, Zelazo et al. [21] demonstrated the effectiveness of a 6-week intervention involving goal-directed problem-solving and mindfulness training in improving executive function skills, such as cognitive flexibility and inhibitory control, among preschool children.

4.2 Ecological Validity

In line with the principle of ecological validity, it is essential that training takes place in the environments where people usually live, such as schools and workplaces. This approach ensures that the training is more relevant to their everyday experiences, making it easier to apply the skills they learn to real-life situations directly. By integrating training exercises into these familiar contexts, individuals can develop and enhance their skills, such as self-regulation and executive functions, with a greater likelihood of practical and meaningful application in their daily lives [17]. This approach enhances the transfer of learned skills from the training setting to the real world, providing more effective and applicable results for the individuals involved.

4.3 Development of Emotional Intelligence

Cultivating emotional intelligence is essential for fostering empathy, understanding, and social responsibility among students [14]. Emotional intelligence encompasses resilience, compassion, reasoning, problem-solving, stress management, social interaction, and conflict resolution [14]. Fostering emotional intelligence alongside executive functions can contribute to a positive and inclusive learning environment [14]. Educators can help students develop the necessary emotional skills to navigate challenges, build meaningful relationships, and effectively communicate with others by actively promoting emotional intelligence in educational settings. This nurturing of emotional intelligence creates a foundation for personal growth and social development, preparing students for academic and future success.

4.4 Incorporating Metacognitive Practices

Metacognition encompasses a set of skills and strategies that involve raising consciousness. Individuals can observe, regulate, and adapt their internal cognitive processes. Moreover, they can differentiate between functional and dysfunctional states of mind, consciously opting for those states that empower them to explore their abilities and identity fully [22]. Metacognitive practices that enhance attention, self-awareness, and self-reflection are pivotal in supporting students' cognitive development [22]. Integrating metacognitive skills into instruction and learning activities empowers students to become independent thinkers and self-directed learners, preparing them to adapt to life challenges [22]. Similarly, Drigas and Karyotaki [6] emphasized the significance of self-regulation and executive functions in promoting cognitive flexibility, emotional regulation, and decision-making abilities in various populations, including those with special educational needs. By honing self-regulatory abilities and improving attentional control through metacognitive practices, individuals can rise above biases and prejudices, approaching conflicts with an open mind and willing to seek mutual understanding and common ground.

4.5 Problem-solving skills

Enhancing problem-solving skills can be a valuable approach to support individuals with cognitive control deficits and executive function impairments, leading to improved decision-making, adaptability, and everyday functioning in various populations, including those with ADHD, Autism Spectrum Disorder (ASD), Oppositional Defiant Disorder (ODD), older adults, and those with Traumatic Brain Injury (TBI). By targeting problem-solving skills, individuals with cognitive control and executive function impairments can experience significant benefits in their decision-making, adaptability, and everyday functioning [6].

4.6 Brain Rewiring Techniques

Brain rewiring techniques, such as cognitive-behavioral therapy, mindfulness-based interventions, neurofeedback, clinical hypnosis, Neuro-Linguistic Programming (NLP), exercise, yoga, music therapy, and working memory exercises, have demonstrated the potential to promote self-regulation and emotional control [23]. By leveraging the brain's neuroplasticity, these interventions seek to modify brain function and structure, ultimately leading to improved cognitive abilities and self-regulation in individuals, including those with ADHD.

4.7 Artistic Activities-Creative Engagements

Engagement in artistic activities such as theater, orchestra, choir, music training, drama, or pretend play may foster EF skills by requiring children to stay in a role, inhibit their behavior, and regulate their emotions. The findings suggest that these creative interventions offer valuable opportunities for developing EF skills, contributing to children's cognitive, emotional, and social growth [24].

4.8 Sensory Stimulation Techniques

Stimulating the senses can significantly impact an individual's ability to balance alertness and agitation. Various sensory stimulation interventions, such as music, light therapy, animal-assisted therapy, acupuncture, reflexology, massage, and aromatherapy, have promising effects in promoting relaxation and overall well-being [25]. Additionally, exposure to nature has been found to have beneficial effects, including reducing glucose levels and mental fatigue while restoring attention. Integrative body-mind training has also shown positive outcomes, such as reducing stress hormones and anxiety levels and improving attention [26].

4.9 Mindful Eating Habits

Nutritional enhancers boost encoding, reduce fatigue and help cognitive capacities, such as attention and working memory, to operate more effectively. Adopting a healthy lifestyle through mindful eating habits provides a foundation for optimizing self-regulation skills and executive functions. Nutritional enhancers are crucial in boosting cognitive functions, optimizing memory encoding, and reducing fatigue, ultimately leading to improved attention and enhanced working memory. Individuals can establish a strong foundation for optimizing their self-regulation skills and executive functions by adopting a healthy lifestyle that prioritizes mindful eating habits. These nutritional strategies support physical health and profoundly impact mental well-being, allowing individuals to operate at their cognitive best [27].

4.10 Utilizing Technology

Integrating Information and Communication Technologies (ICTs) into education can motivate students to approach learning actively, enhancing their talents and executive skills [1]. Digital technologies, including virtual reality, offer engaging and immersive tools that can effectively support interventions for ADHD and emotional and behavioral disorders [1, 23]. Additionally, virtual reality and metacognition training techniques promise to improve cognitive function and metacognitive skills in individuals with learning disabilities, including ADHD [28]. Similarly, robots can be used as tools for intervention and treatment in people diagnosed with autism. Robots may facilitate social interaction, improve cognitive and metacognitive skills, and help individuals with ASD develop higher mental abilities and social skills [29]. Furthermore, Training sessions (engage in specific executive function training, such as working memory exercises, for approximately 45 minutes per day, over 6-8 weeks) often take the form of video game-like activities involving tasks that require remembering a series of locations, adapting actions based on contextual cues, and overriding automatic responses [17].

By combining and implementing these strategies in educational and therapeutic settings, individuals can experience improved self-regulation, executive functions, and overall well-being. These interventions can empower individuals to face life challenges with resilience, adaptability, and emotional intelligence, ultimately fostering a positive and inclusive learning environment for all. Additionally, ongoing research and evaluation of these strategies will continue to refine and enhance their effectiveness, ensuring that individuals receive the most beneficial and tailored support for their unique needs and strengths.

5 Examples of Successful Self-Regulation Practices – Approaches

5.1 Peer Mediation Programs

Peer mediation programs provide students with opportunities to develop and apply conflict resolution skills with the support of trained mediators or peers [30]. These programs have positively promoted self-regulation and constructive

conflict-resolution strategies. By engaging students in mediating conflicts, peer mediation programs encourage the development of executive functions, including problem-solving, active listening, perspective-taking, and self-control. Students learn to regulate emotions, communicate effectively, and work collaboratively to find peaceful resolutions.

5.2 Individualized Self-Regulated Strategy Development

Self-Regulated Strategy Development is a targeted and personalized approach within the broader framework of Self-Regulated Strategy Development (SRS) [31]. This approach recognizes students' unique needs and challenges, particularly those with emotional and behavioral disorders (EBD), and aims to provide tailored support in developing their self-regulation skills. By individualizing the SRS instructional approach, educators can design strategies that address specific goal-setting deficits, self-monitoring, self-instructions, and self-reinforcement. This individualized approach empowers students with EBD to participate in their learning actively, promoting a sense of ownership and fostering their academic success within a peaceful and inclusive educational environment.

5.3 Family-Based Interventions

Family-based interventions can positively impact children's executive functions and self-regulation skills, including conflict-resolution abilities [32]. These interventions involve engaging families in structured programs that provide training, resources, and support. Families can enhance their children's executive functions, such as emotional control, impulse management, and cognitive flexibility, by promoting consistent routines, open communication, and effective conflict-resolution strategies. The study by Motamed Yeganeh et al. [32] found that a family-based neuropsychological program significantly improved the executive functions of children with ADHD. These findings suggest that involving families in interventions can be a promising approach for supporting young children with ADHD.

5.4 Social-Emotional Learning (SEL)

School-based initiatives like Social-Emotional Learning (SEL) are specifically crafted to assist students in fostering essential soft skills. These skills encompass self-awareness, social awareness, self-management, relationship skills, and responsible decision-making. The primary objective of such programs is to guide students toward recognizing their strengths and weaknesses, promoting self-esteem, demonstrating empathy, effectively managing emotions, engaging in constructive negotiations, assessing risks prudently, and making responsible and thoughtful choices[33].

Incorporating these examples of successful self-regulation practices, professionals in education settings can implement targeted interventions that foster executive function development and create more harmonious and inclusive learning environments for all students.

6 Role of Social Media in Education Settings

Social media has transformed education, providing students and teachers numerous opportunities and benefits. It revolutionizes sharing information, communicating, and enhancing learning experiences. However, alongside its advantages, social media also presents specific challenges that educators and society must address.

6.1 Challenges of Social Media in Education

The use of social media in education presents several challenges that need to be addressed to ensure a safe and inclusive learning environment. One significant challenge is social media addiction (SMA). Recent research by Reed [34] highlights the association between social media addiction (SMA) and impulse control issues. These findings emphasize the importance of addressing the potential adverse effects of social media addiction on students' cognitive abilities within educational settings.

Additionally, integrating social media into education presents various challenges, such as conflicts, cyberbullying, and privacy concerns, which can significantly impede the learning environment. These challenges are incredibly impactful for students with special educational needs (SEN), particularly those with Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD)[35].

A notable study by Wang et al. [36] identified anxiety as a significant issue experienced by individuals with ASD when using social media. The study found that these individuals reported feeling anxious when messages or friend requests were not answered immediately. To cope with such situations, they had to employ specific mechanisms to handle the anxiety arising from social interactions on these platforms. Additionally, participants expressed concerns about encountering harassment and cyberbullying on social media platforms, both in public posts and private group chats. Some participants resorted to blocking the perpetrator or negative posters to handle negative interactions. Privacy also

emerged as another significant concern, with participants being cautious about sharing private information online and connecting with strangers.

Therefore, it becomes crucial for educators to prioritize digital literacy education, promote responsible online behavior, and cultivate self-regulation skills among students. By equipping students with these skills, they can navigate social media responsibly, resolve conflicts constructively, and fully leverage the potential benefits of social media for conflict resolution. This is especially important for students with special educational needs, as they may require additional support and guidance in developing these skills [37].

To effectively address these challenges, educators must also consider the reconceptualization of nature-of-science education in the age of social media [38]. By integrating social media into science education, students can gain a deeper understanding of the nature of science, engage in collaborative learning, and develop critical thinking skills. However, this integration requires careful consideration of ethical and privacy issues and promoting responsible online behavior and information evaluation.

Prioritizing digital literacy education, promoting responsible online behavior, and providing additional support for students with special educational needs will enable students to harness the benefits of social media while mitigating its potential risks. Through these efforts, social media can significantly enhance students' learning experiences in the digital era.

6.2 Potential Benefits of Social Media Use in Education

Social media has become an essential tool in various fields, including education. It offers numerous benefits for both students and teachers, providing opportunities for enhanced learning experiences. These benefits include:

6.2.1 Social Media as a Communication Channel for Teachers and Students

Effective communication between teachers and students is crucial for successful learning experiences. Insufficient communication hampers the teaching and learning process, emphasizing the need for teachers to monitor students and understand their challenges [39] closely. Many schools express concerns about the erratic behavior of students, highlighting the importance of exploring the potential benefits of social media platforms in facilitating modern education. Popular platforms such as Facebook and Twitter can serve as effective backchannels for communication between teachers and students within and across classes. They can also be utilized to inform students about special lectures, panel discussions, or guest speakers. Teacher-student interaction contributes significantly to identifying and addressing learning difficulties efficiently. Social media improves communication between students and teachers and fosters communication among students. Students can utilize social networks to discuss assignments, and exams and seek help from classmates who can provide details on test materials or assignment requirements. Moreover, social media platforms enable students to follow and support each other online [39].

6.2.2 Social Media as a Student Engagement Tool

Social media serves as a student engagement tool, capturing students' attention and fostering their active involvement in learning [37, 40]. It allows students to express themselves, share resources, and collaborate with peers. Educators can create engaging learning activities and extend students' time on their homework or related school projects by incorporating social media tools like Facebook, Twitter, or YouTube. Social media platforms also offer a way to combat classroom boredom and increase behavioral engagement by designing social and interactive learning activities, such as discussions, debates, and group projects [41]. For shy students, social media provides a more comfortable and less intimidating environment for expressing themselves and engaging in discussions [40]. Additionally, social media allows for increased interaction between students and teachers, overcoming time and location barriers and providing more opportunities for questions, comments, and feedback, which fosters supportive relationships between students and their teachers [40].

Furthermore, social media usage in education can be especially beneficial for individuals on the autism spectrum. It serves as a platform for these individuals to pursue special interests and engage with like-minded individuals in communities and fan groups [36]. The immersive nature of social media allows individuals to occupy their time and express their passions, providing an outlet for self-expression and creativity [36]. For students with autism, social media can offer an inclusive space to connect with others with similar interests and experiences, fostering a sense of belonging and social interaction that might be challenging in traditional settings.

Additionally, incorporating YouTube and other social media platforms as student engagement tools offers numerous benefits in language learning. It promotes active participation, creativity, critical thinking, effective communication, and collaboration – all vital skills for students to excel in the 21st century. By leveraging YouTube's unique advantages, educators can create a vibrant and inclusive learning environment, enhancing students' speaking abilities and equipping them with essential competencies for future success [42].

Furthermore, research by Muna [43] has explored the effectiveness of using YouTube as a learning media in the classroom to improve students' speaking skills, particularly in the context of Senior High School students. The findings highlighted the potential of YouTube videos to enhance students' speaking abilities, making them a valuable and innovative addition to learning resources.

6.2.3 *Social Media as a Collaborative Platform*

Collaboration is vital today, and social media platforms facilitate collaborative learning experiences. Unlike traditional learning models focusing on individual processes, social media collaboration platforms enable collective thinking and intelligence. Research indicates active student involvement and group work lead to better learning outcomes and enhanced problem-solving skills. Social media allows students to collaborate on projects beyond individual capabilities. Platforms like wikis, open websites, or forums enable multiple users to work on the same content. Wikis support collaborative writing by providing structures for editing and reviewing. Additionally, wiki annotations track contributions, allowing the teachers to verify the participation of group members [40,41].

By leveraging the benefits of social media in education, educators can create dynamic and interactive learning environments that transcend traditional classroom settings. These innovative learning experiences prepare students for success in a globalized world, equipping them with essential 21st-century skills and fostering well-rounded, autonomous, and confident learners ready to thrive in the digital era.

7 Discussion

The present literature review has delved into the critical interplay between self-regulation, executive functions (EFs), and social media in fostering a peaceful and inclusive educational environment. By synthesizing relevant studies, we have gained valuable insights into the significance of these cognitive abilities in educational settings and their implications for promoting positive conflict resolution and emotional well-being among students. One of the key findings of this review is the neurobiological basis of executive functions, particularly their association with neurodevelopmental disorders such as Autism Spectrum Disorder (ASD) and Attention-Deficit/Hyperactivity Disorder (ADHD). The observed deficits in EFs among individuals with ASD and ADHD underscore the importance of targeted interventions to support their conflict resolution skills. By considering neurobiological factors, educators can tailor strategies to enhance self-regulation and executive functions, thus empowering students with special educational needs (SEN) to navigate conflicts constructively.

Moreover, this review highlights the significance of early education, training, and ecological validity in cultivating self-regulation skills and executive functions. Interventions for young children during their rapid brain development can produce more effective outcomes. Educators and therapists can create a conducive learning environment by incorporating metacognitive practices, problem-solving skills training, and mindfulness-based interventions. Furthermore, family-based interventions can be crucial in shaping students' executive functions and self-regulation skills. Engaging families in structured programs that promote effective communication and understanding can further improve self-regulation and conflict-resolution abilities in children with ADHD and other behavioral challenges.

Another key aspect explored in this review is the role of social media in education. Social media platforms offer communication channels that can enhance student engagement and collaborative learning experiences. However, the challenges posed by social media addiction, conflicts, cyberbullying, and privacy concerns should not be ignored. Professionals in education settings must emphasize digital literacy education and promote responsible online behavior among students to create a safe and inclusive digital learning environment. Finally, it's critical to emphasize how beneficial and productive all digital technologies are for the field of executive function's education. The use of these technologies, which include mobile devices (44-45), a range of ICT apps (46-57), AI & STEM ROBOTICS (58-61), and games (62), facilitates and improves educational processes including evaluation, intervention, and learning. Additionally, the use of ICTs along with theories and models of metacognition, mindfulness, meditation, and the development of emotional intelligence [63-74], accelerates and improves educational practices and outcomes, especially for self-regulation and peace training.

8 Conclusion

Concluding, this comprehensive literature review has shed light on the vital role of self-regulation and executive functions in conflict resolution within educational settings. Understanding the neurobiological basis of executive functions, especially in neurodevelopmental disorders, provides valuable insights for developing targeted interventions to support students with special educational needs. Early education, training, and ecological validity are pivotal in promoting self-regulation skills and executive functions. By integrating metacognitive practices and mindfulness-based interventions, educators, therapists, and parents can create an environment that fosters cognitive and emotional development in students, enhancing their self-regulation and conflict-resolution abilities. Additionally, social media's impact on education presents both opportunities and challenges. While social media platforms can facilitate communication and collaboration, educators must address the potential negative consequences, such as cyberbullying and social media addiction, through digital literacy education and responsible online behavior promotion.

The findings of this review have practical implications for educators, parents, therapists, and policymakers, emphasizing the importance of nurturing emotional regulation, promoting metacognitive practices, and ensuring responsible social media use to create a harmonious and inclusive educational environment. In summary, by continuously exploring and implementing practical approaches that enhance self-regulation, executive functions, and positive conflict-resolution strategies, professionals and parents can create a conducive learning environment that promotes empathy, supports positive relationships, and facilitates the holistic development of all students and all those involved or participating in educational and intimate learning environments.

Compliance with ethical standards

Acknowledgments

The Authors would like to thank University of Thessaly Team for their support.

Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

References

- [1] Gkora, V., & Driga, A. M. (2023). The role of ICTs in student's emotional and behavioral difficulties.
- [2] Sekerci, H., & Yilmaz, F. (2021). The Role of Respectful Behaviour in the Relationship between Empathetic Tendencies and Conflict Resolution in Primary School Students. *Eurasian Journal of Educational Research*, 93, 73-94.
- [3] Grzybowska, K., & Łupicka, A. (2017). Key competencies for Industry 4.0. *Economics & Management Innovations*, 1(1), 250-253. <https://doi.org/10.26480/icemi.01.2017.250.253>
- [4] Diamond, A. (2013). Executive functions. *Annual review of psychology*, 64, 135-168.
- [5] Petersen, S. E., & Posner, M. I. (2012). The attention system of the human brain: 20 years after. *Annual review of neuroscience*, 35, 73-89. <https://doi.org/10.1146/annurev-neuro062111-150525>
- [6] Drigas, A., & Karyotaki, M. (2019). Executive Functioning and Problem Solving: A Bidirectional Relation. *Int. J. Eng. Pedagog.*, 9(3), 76-98.
- [7] Heatherton, T. F. (2011). Neuroscience of self and self-regulation. *Annual review of psychology*, 62, 363-390.
- [8] Xin, Sheppard & Brown, 2017). Xin, J. F., Sheppard, M. E., & Brown, M. (2017). Brief report: Using iPads for selfmonitoring of students with autism. *Journal of autism and Developmental Disorders*, 47(5), 1559-1567.
- [9] Ardila, A. (2016). Is self-consciousness equivalent to executive function? *Psychology and Neuroscience*, 1-6. https://doi.org/10.1007/978-3-319-50340-0_43
- [10] Mitsea, E., Drigas, A., & Skianis, C. (2022). Metacognition in Autism Spectrum Disorder: Digital Technologies in Metacognitive Skills Training. *Technium Soc. Sci. J.*, 31, 153.
- [11] Spencer-Smith M, Klingberg T. Benefits of a working memory training program for inattention in daily life: a systematic review and meta-analysis. *PLoS One*. 2015;10:e0119522.

- [12] El Wafa, H. E. A., Ghobashy, S. A. E. L., & Hamza, A. M. (2020). A comparative study of executive functions among children with attention deficit and hyperactivity disorder and those with learning disabilities. *Middle East Current Psychiatry*, 27(1), 1-9.
- [13] Toole, S.E.O.; Monks, C.P.; Tsermentseli, S. Executive Function and Theory of Mind as Predictors of Aggressive and Prosocial Behavior and Peer Acceptance in Early Childhood. *Soc. Dev.* 2017, 26, 907–920.
- [14] Espino-Díaz, L., Fernández-Caminero, G., Hernández-Lloret, C. M., González-González, H., & Álvarez-Castillo, J. L. (2021). Emotional intelligence and executive functions in the prediction of prosocial behavior in high school students. An Interdisciplinary approach between neuroscience and education. *Children*, 8(9), 759.
- [15] Moriguchi, Y.; Shinohara, I.; Todo, N.; Meng, X. Prosocial Behavior Is Related to Later Executive Function during Early Childhood: A Longitudinal Study. *Eur. J. Dev. Psychol.* 2019, 17, 352–364.
- [16] Kim, J.Y.; Kim, T.; Kang, M.J. Analysis on the Structural Relationship between Interaction, Executive Function Difficulty, and Language Ability. *Korean J. Child Studies* 2021, 42, 305–314.
- [17] Blair C. Educating executive function. *Wiley Interdiscip Rev Cogn Sci.* 2017 Jan;8(1-2):10.1002/wcs.1403. doi: 10.1002/wcs.1403. Epub 2016 Dec 1. PMID: 27906522; PMCID: PMC5182118.
- [18] Arnsten AFT. Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience.* 2009; 10:410–422.
- [19] Craig F, Margari F, Legrottaglie A, Palumbi R, De Giambattista C, Margari L. A review of executive function deficits in autism spectrum disorder and attention-deficit/hyperactivity disorder. *Neuropsychiatr Dis Treat.* 2016;12:1191-1202
<https://doi.org/10.2147/NDT.S104620>
- [20] Willcutt EG, Doyle AE, Nigg JT, Faraone SV, Pennington BF. Validity of the executive function theory of attention-deficit/hyperactivity disorder: a meta-analytic review. *Biol Psychiatry.* 2005;57(11):1336–1346.
- [21] Zelazo PD, Forston JL, Masten AS and Carlson SM. (2018). Mindfulness Plus Reflection Training: Effects on Executive Function in Early Childhood. *Front. Psychol.*, 9(208) <https://doi.org/10.3389/fpsyg.2018.00208>
- [22] Drigas, A., & Mitsea, E. (2021). 8 Pillars X 8 Layers Model of Metacognition: Educational Strategies, Exercises & Trainings. *International Journal of Online & Biomedical Engineering*, 17(8).
- [23] Gkora, V., & Driga, A. M. (2023). VIRTUAL REALITY, DIGITAL TECHNOLOGIES AND BRAIN REWIRING TECHNIQUES FOR INTERVENTION IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD). *Journal Health and Technology-JHT*, 2(2), e2237-e2237.
- [24] Takacs, Z. K., & Kassai, R. (2019). The efficacy of different interventions to foster children’s executive function skills: A series of meta-analyses. *Psychological Bulletin*, 145(7), 653–697. <https://doi.org/10.1037/bul0000195>
- [25] Strøm, B. S., Ytrehus, S., & Grov, E. K. (2016). Sensory stimulation for persons with dementia: a review of the literature. *Journal of clinical nursing*, 25(13-14), 1805-1834. <https://doi.org/10.1111/jocn.13169>
- [26] Tang, Y. Y., & Posner, M. I. (2009). Attention training and attention state training. *Trends in cognitive sciences*, 13(5), 222-227. <https://doi.org/10.1016/j.tics.2009.01.009>
- [27] Dresler, M., Sandberg, A., Ohla, K., Bublitz, C., Trenado, C., Mroczko-Wąsowicz, A., ... & Repantis, D. (2013). Non-pharmacological cognitive enhancement. *Neuropharmacology*, 64, 529-543. <https://doi.org/10.1016/j.neuropharm.2012.07.002>
- [28] Drigas A, Mitsea E, Skianis C. Virtual reality and metacognition training techniques for learning disabilities. *Sustainability.* 2022;14(16):10170
- [29] Drigas, A., & Sideraki, A. (2021). Emotional intelligence in autism. *Technium Soc. Sci. J.*, 26, 80.
- [30] Coakley, A. (2019). Peer mediation—conflict management in a class of its own. *Journal of Mediation & Applied Conflict Analysis*, 6(2).
- [31] Sanders, S., Rollins, L. H., Mason, L. H., Shaw, A., & Jolivette, K. (2021). Intensification and individualization of self-regulation components within self-regulated strategy development. *Intervention in School and Clinic*, 56(3), 131-140.
- [32] Motamed Yeganeh, N., Afrooz, G. A., Shokoohi Yekta, M., & Weber, R. (2020). The effectiveness of family-based neuropsychological intervention program on executive functions of children with attention deficit/hyperactivity disorder. *Psychology of Exceptional Individuals*, 9(36), 71-100.

- [33] Schonert-Reichl, K. A., & Hymel, S. (2007). Educating the heart as well as the mind social and emotional learning for school and life success. *Education Canada*, 47(2), 20-25.
- [34] Reed, P. (2023). Impact of social media use on executive function. *Computers in Human Behavior*, 141, 107598.
- [35] Touloupis, T., & Athanasiades, C. (2022). Cyberbullying and empathy among elementary school students: Do special educational needs make a difference?. *Scandinavian journal of psychology*, 63(6), 609-623.
- [36] Wang, T., Garfield, M., Wisniewski, P., & Page, X. (2020, October). Benefits and challenges for social media users on the autism spectrum. In *Conference companion publication of the 2020 on computer supported cooperative work and social computing* (pp. 419-424).
- [37] Tohara, A. J. T. (2021). Exploring Digital Literacy Strategies for Students with Special Educational Needs in the Digital Age. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(9), 3345-3358.
- [38] Höttecke, D., & Allchin, D. (2020). Reconceptualizing nature-of-science education in the age of social media. *Science Education*, 104(4), 641-666.
- [39] Purwanto, A., Fahmi, K., & Cahyono, Y. (2023). The Benefits of Using Social Media in the Learning Process of Students in the Digital Literacy Era and the Education 4.0 Era. *Journal of Information Systems and Management (JISMA)*, 2(2), 1-7.
- [40] Vinnie, G., Muktiarni, M., & Mupita, J. (2021). The Effectiveness of Social Media Utilization in Learning at Elementary School. *Jurnal Abdimas Kartika Wijayakusuma*, 2(2), 164-169
- [41] Yustika, G. P., & Iswati, S. (2020). Digital literacy in formal online education: A short review. *Dinamika Pendidikan*, 15(1), 66-76.
- [42] Sari, Y. N., & Margana, M. (2019). YouTube as a learning media to improve the student's speaking ability in 21st century. *Journal of English Language Teaching and Linguistics*, 4(2), 263. 12.
- [43] Muna, MS. (2011). Utilizing YouTube Videos to Enhance Students' Speaking Skill. Surakarta, Indonesia. Retrieved from Sebelas Maret University database.
- [44] Stathopoulou A, Karabatzaki Z, Tsiros D, Katsantoni S, Drigas A, 2019 Mobile apps the educational solution for autistic students in secondary education *Journal of Interactive Mobile Technologies (IJIM)* 13 (2), 89-101 <https://doi.org/10.3991/ijim.v13i02.9896>
- [45] Drigas A, DE Dede, S Dedes 2020 Mobile and other applications for mental imagery to improve learning disabilities and mental health *International Journal of Computer Science Issues (IJCSI)* 17 (4), 18-23 DOI:10.5281/zenodo.3987533
- [46] Drigas, A. S., Koukianakis, L, Papagerasimou, Y. (2006) "An elearning environment for nontraditional students with sight disabilities.", *Frontiers in Education Conference, 36th Annual. IEEE*, p. 23-27. <https://doi.org/10.1109/FIE.2006.322633>
- [47] Drigas A, Petrova A 2014 ICTs in speech and language therapy *International Journal of Engineering Pedagogy (ijEP)* 4 (1), 49-54 <https://doi.org/10.3991/ijep.v4i1.3280>
- [48] Bravou V, Drigas A, 2019 A contemporary view on online and web tools for students with sensory & learning disabilities *ijOE* 15(12) 97 <https://doi.org/10.3991/ijoe.v15i12.10833>
- [49] Xanthopoulou M, Kokalia G, Drigas A, 2019, Applications for Children with Autism in Preschool and Primary Education. *Int. J. Recent Contributions Eng. Sci. IT (IJES)* 7 (2), 4-16 <https://doi.org/10.3991/ijes.v7i2.10335>
- [50] Stathopoulou A, Spinou D, Driga AM, 2023, Burnout Prevalence in Special Education Teachers, and the Positive Role of ICTs, *ijOE* 19 (08), 19-37
- [51] Stathopoulou A, Spinou D, Driga AM, 2023, Working with Students with Special Educational Needs and Predictors of Burnout. The Role of ICTs. *ijOE* 19 (7), 39-51
- [52] Loukeri PI, Stathopoulou A, Driga AM, 2023 Special Education Teachers' Gifted Guidance and the role of Digital Technologies, *TECH HUB* 6 (1), 16-27
- [53] Stathopoulou A, Temekinidou M, Driga AM, Dimitriou 2022 Linguistic performance of Students with Autism Spectrum Disorders, and the role of Digital Technologies *Eximia* 5 (1), 688-701
- [54] Vouglanis T, Driga AM 2023 Factors affecting the education of gifted children and the role of digital technologies. *TechHub Journal* 6, 28-39

- [55] Vouglanis T, Driga AM 2023 The use of ICT for the early detection of dyslexia in education, TechHub Journal 5, 54-67
- [56] Drakatos N, Tsompou E, Karabatzaki Z, Driga AM 2023 Virtual reality environments as a tool for teaching Engineering. Educational and Psychological issues, TechHub Journal 4, 59-76
- [57] Drakatos N, Tsompou E, Karabatzaki Z, Driga AM 2023 The contribution of online gaming in Engineering education, Eximia 8, 14-30
- [58] Chaidi E, Kefalis C, Papagerasimou Y, Drigas, 2021, Educational robotics in Primary Education. A case in Greece, Research, Society and Development 10 (9), e17110916371-e17110916371 <https://doi.org/10.33448/rsd-v10i9.16371>
- [59] Lytra N, Drigas A 2021 STEAM education-metacognition-Specific Learning Disabilities Scientific Electronic Archives 14 (10) <https://doi.org/10.36560/141020211442>
- [60] Ntaountaki P, et all 2019 Robotics in Autism Intervention. Int. J. Recent Contributions Eng. Sci. IT 7 (4), 4-17, <https://doi.org/10.3991/ijes.v7i4.11448>
- [61] Demertzi E, Voukelatos N, Papagerasimou Y, Drigas A, 2018 Online learning facilities to support coding and robotics courses for youth International Journal of Engineering Pedagogy (iJEP) 8 (3), 69-80, <https://doi.org/10.3991/ijep.v8i3.8044>
- [62] Chaidi I, Drigas A 2022 Digital games & special education Technium Social Sciences Journal 34, 214-236 <https://doi.org/10.47577/tssj.v34i1.7054>
- [63] Drigas A, Mitsea E, Skianis C 2021 The Role of Clinical Hypnosis & VR in Special Education International Journal of Recent Contributions from Engineering Science & IT (IJES) 9(4), 4-18. <https://doi.org/10.3991/ijes.v9i4.26147>
- [64] V Galitskaya, A Drigas 2021 The importance of working memory in children with Dyscalculia and Ageometria Scientific Electronic Archives 14 (10) <https://doi.org/10.36560/141020211449>
- [65] Chaidi I, Drigas A 2020 Parents' Involvement in the Education of their Children with Autism: Related Research and its Results International Journal Of Emerging Technologies In Learning (IJET) 15 (14), 194-203. <https://doi.org/10.3991/ijet.v15i14.12509>
- [66] Drigas A, Mitsea E, Skianis C. 2022 Virtual Reality and Metacognition Training Techniques for Learning Disabilities SUSTAINABILITY 14(16), 10170, <https://doi.org/10.3390/su141610170>
- [67] Drigas A., Sideraki A. 2021 Emotional Intelligence in Autism Technium Soc. Sci. J. 26, 80, <https://doi.org/10.47577/tssj.v26i1.5178>
- [68] Bamicha V, Drigas A, 2022 The Evolutionary Course of Theory of Mind - Factors that facilitate or inhibit its operation & the role of ICTs Technium Social Sciences Journal 30, 138-158, DOI:10.47577/tssj.v30i1.6220
- [69] Karyotaki M, Bakola L, Drigas A, Skianis C, 2022 Women's Leadership via Digital Technology and Entrepreneurship in business and society Technium Social Sciences Journal. 28(1), 246–252. <https://doi.org/10.47577/tssj.v28i1.5907>
- [70] Drigas A, Papoutsi C, 2021, Nine Layer Pyramid Model Questionnaire for Emotional Intelligence, International Journal of Online & Biomedical Engineering 17 (7), <https://doi.org/10.3991/ijoe.v17i07.22765>
- [71] Drigas A, Papoutsi C, Skianis, 2021, Metacognitive and Metaemotional Training Strategies through the Nine-layer Pyramid Model of Emotional Intelligence, International Journal of Recent Contributions from Engineering, Science & IT (iJES) 9.4 58-76, <https://doi.org/10.3991/ijes.v9i4.26189>
- [72] Mitsea E, Drigas A, Skianis C, 2022 ICTs and Speed Learning in Special Education: High-Consciousness Training Strategies for High-Capacity Learners through Metacognition Lens Technium Soc. Sci. J. 27, 230, <https://doi.org/10.47577/tssj.v27i1.5599>
- [73] Drigas A, Karyotaki M, Skianis C, 2017 Success: A 9 layered-based model of giftedness International Journal of Recent Contributions from Engineering, Science & IT 5(4) 4-18, <https://doi.org/10.3991/ijes.v5i4.7725>
- [74] Drigas A, Mitsea E, Skianis C, 2022 Intermittent Oxygen Fasting and Digital Technologies: from Antistress and Hormones Regulation to Wellbeing, Bliss and Higher Mental States BioChemMed 3 (2), 55-73