

Psychosocial Correlates of Executive Functioning in Children and Adolescents

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Abstract

Executive functioning (EF) reflects an individual's ability to reason, analyze, memorize, and respond according to the situation and develops interminably across childhood and adolescence. Although previous research has identified several factors influencing EF across developmental stages, the present review aims to identify the psychological and social correlates of executive functioning, particularly among children and adolescents. A search for previous literature was conducted in the Scopus, PsycINFO, PubMed, and Google Scholar databases. The review indicates that EF is associated with major psychological factors like depression, anxiety, stress, emotional regulation, and its consequential behaviours. Social factors like socioeconomic status, parental support and warmth, peer interactions, relationships with teachers, maltreatment during childhood, and cultural impact also influenced EF among children and adolescents. The observations from the present review can aid in enhancing the EF of the concerned population by planning individualized interventions to improve goal-directed behavior and help future researchers explore executive functioning from a more holistic perspective.

Keywords: Executive functioning, children, adolescents, psychosocial factors

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Executive functioning (EF) is primarily concerned with controlling and coordinating cognitive processes while performing complex cognitive tasks (Monsell, 1996). It enables individuals to plan, organize, and accomplish goals (Suchy, 2015). However, the researchers need more consensus about the conceptualization of this higher-order cognitive function (Souissi et al., 2022). According to Miyake et al. (2000), three frequently studied EFs are mental set shifting, information updating and monitoring, and inhibition of prepotent responses. Diamond (2013) puts it slightly differently as inhibition, working memory, and cognitive flexibility. Cassidy (2016) states that executive functioning is a set of interconnected self-regulatory skills that develop through childhood and adolescence and contribute to cognitive, behavioral, emotional, and social functioning.

Evidence from neuropsychological studies indicates that neural circuits in the prefrontal cortex predominantly mediate EF (Barkley, 2012; Shallice, 2002), thus making it an integrated control system functioning through different interrelated systems (Alexander & Stuss, 2000). Cognitive processes like attention, working memory, inhibitory control, cognitive flexibility, planning, decision-making, and emotional regulation, which fall under the umbrella term of executive functioning, are influenced by these neural circuits (Awh et al., 2006; McAuley & White, 2011; Verdejo-García & Bechara, 2010). The development of neural circuits underlying executive functioning in childhood and adolescence is characterized by a gradual maturation of prefrontal brain regions, enabling more efficient cognitive control and decision-making. This process is influenced by both genetic factors and environmental experiences, with executive functions continuing to refine and strengthen as individuals transition into adulthood.

Developmental studies (Anderson, 2002) conclude that attentional control, an essential aspect of EF, emerges in infancy and develops rapidly in early childhood. Other executive functions like cognitive flexibility, goal setting, and information processing were observed to develop comprehensively by 12 years after passing through a critical developmental phase between ages 7 and 9. Adolescence is a period of rapid development where the total brain volume reaches almost adult levels (Dumontheil, 2016), the cognitive functions continue to evolve with staggered development of the subcortical and prefrontal cortex network (Del Giacco et al., 2022; Luna et al., 2015). Such developmental changes affect adolescents' regulatory EFs and impulse control, making them highly susceptible to rewarding risk-taking behavior (Del Giacco et al., 2022; Luna et al., 2015; Steinberg, 2008), which can result in negative affective states, consequently impacting their cognitive development, academic achievement, social relationships, and overall well-being.

There is ample research evidence that suggests a broad range of biopsychosocial factors related to EF among children and adolescents. The present review includes a concise understanding of the psychological and social factors influencing EF. The capacity for executive functioning is significantly shaped by psychosocial factors. Such factors include socioeconomic position, familial circumstances, education, stress, interpersonal connections etc. According to research, those who are exposed to unfavorable psychosocial situations including trauma, stress, or poverty frequently display executive functioning deficiencies. A supportive and enriched psychosocial environment can enhance executive functioning by providing opportunities for cognitive development and emotional regulation. Therefore, fostering healthy cognitive development and resolving cognitive problems in varied populations depend on our ability to comprehend the complex interplay between psychosocial factors and executive functioning.

Understanding how factors such as stress, anxiety, socioeconomic status, family dynamics, and peer interactions influence executive functioning can inform interventions and support systems that promote healthy cognitive development of young individuals.

Methods

A search for previous literature was carried out in Scopus, PsycINFO, PubMed, and Google Scholar databases using search terms "executive functioning," "children," and "adolescents" in combination with "psychological factors." or "social factors." The review was done up to 19th April 2023. Two reviewers screened the papers, initially by analyzing the title and abstract and later by a full article review.

Inclusion criteria

Studies exploring EF factors like working memory, inhibitory control, cognitive flexibility, attention, and so on, measured through both performance tests and self-report measures, in children and adolescents from birth to 19 years, were included. We have only included original research articles written in English and published in various databases between 2003 and 2023.

Exclusion criteria

Studies exploring EF with respect to biological factors like developmental delays, maternal health, and chronic health conditions were excluded as the focus was on the psychosocial factors influencing EF. Narrative, scoping and systematic reviews were also excluded.

Results and Discussion

The review points to several psychological, socio-demographic, and environmental facets contributing to executive functioning among children and adolescents. For better understanding, the EF is explored under two major subheads: psychological and social factors.

Psychological Factors Affecting Executive Functioning

The development of executive functioning in children and adolescents is profoundly influenced by a range of psychological factors that shape their cognitive and behavioral capabilities. Psychological factors like depression, anxiety, and stress are related to EF. These psychological states of children and adolescents can alter their decision-making skills, attention, concentration, and other cognitive facets. In a longitudinal study, Connolly et al. (2014) found that baseline rumination predicts decreased selective attention and attentional switching among adolescents. Children exhibiting intense depressive symptoms also have higher learning issues and attentional deficits (Ciuhan & Iliescu, 2021). Clinical depression among children and adolescents negatively predicts working memory, cognitive flexibility, and attention (Favre et al., 2009; Holler et al., 2014).

As psychological aspects are often manifested through actions, behavioural factors are also important. Behavioral risks such as sleep disturbances, emotional instability, and restlessness during childhood are some of the significant factors influencing adolescent EF (Berthelsen et al., 2017). A longitudinal study by Donati et al. (2021) indicates that internalizing behaviors, such as social withdrawal, and anxiety, and externalizing behaviors, such as physical aggression, disobedience, and substance abuse during early adolescence, negatively correlate with working memory and inhibitory control in late adolescence. Adolescents experiencing high anxiety and stress levels may find it challenging to manage their cognitive processes effectively.

And working memory was found to mediate the positive relationship between trait anxiety and academic performance among middle school students (Alfonso & Lonigan, 2020).

Experience of stress is another important aspect. Evidence shows children behaving impulsively while encountering stressful situations resulting from impaired self-control (Duckworth et al., 2012). Similar results were manifested among adolescents, too (Jeong et al., 2019). Acute stress often results in risky adolescent decision-making (Uy & Galván, 2017), as it often affects one's ability to assess and mitigate risks effectively. Altogether, psychological factors, such as anxiety, stress, depression, and emotional control, play a pivotal role in shaping the development and efficiency of executive functioning in adolescents. Thus, addressing psychological factors and providing adolescents with appropriate support and training can improve their executive functioning, leading to better academic performance, decision-making, and overall success in various aspects of life. The research on psychological factors associated with EF is summarized in Table 1.

Table 1

Summary of Research on Psychological Factors Affecting Executive Functioning

Author(s)	Participants	Design	Significant result(s)
Connolly et al., 2014	12- 13 years	Experimental design (pretest-posttest)	Rumination is negatively correlated with selective attention and attentional switching.
Favre et al., 2009	8 – 17-year-olds with major depressive disorder (MDD) and control group	Cross-sectional study	Mental processing speed is low in children and adolescents with MDD.

Holler et al., 2014	14- 16 years old with clinically diagnosed depression and control group	Experimental design (pre-test only)	Deficits in working memory, attention or cognitive flexibility among adolescents diagnosed with minor/ major depression.
Berthelsen et al., 2017	4- 15 years	Longitudinal study	Child behavioral risks (sleep disturbances, emotional instability, and restlessness), maternal behaviors towards the child, family income, and EF functioning have a statistically significant relationship. Attentional control and self-regulatory learning strategies during the early stages are essential for EF development in later stages.
Donati et al., 2021	Children at age 1 year, 7 years, and later between 10 – 19 years	Longitudinal study	Early externalizing behaviors are strongly correlated with working memory in later stages of development.
Alfonso & Lonigan, 2020	10 to 15 years	Cross-sectional study	Working memory mediates the relationship between trait anxiety and academic achievement, and those relationships are positive.
Duckworth et al., 2013	10 to 13 years	Longitudinal study	Negative life experiences negatively influenced self-control during early adolescence.
Jeong et al., 2019	10 to 16 years	Longitudinal study	Academic stress negatively impacts self-control.

Uy & Galván, 2017	Adolescent boys of 15 to 17 years	Cross-sectional study	Stress results in risky decision making
Ciuhan & Ilescu, 2021	7 to 12 years	Cross-sectional study	Depression results in attentional deficit and other FF dysfunctions

Social Factors Affecting Executive Functioning

Social factors encompass elements such as family dynamics, peer relationships, community environment, and cultural influences that collectively shape and impact the development of executive functioning in children and adolescents. Family socioeconomic position is one prominent factor found to be related to executive functioning (Berthelsen et al., 2017; Blair et al., 2011). Piccolo et al. (2019) suggest that higher economic status enhances children's working memory, inhibitory control, and cognitive flexibility. Children from low-income families may face more stressors and have limited access to resources supporting cognitive development, impacting their executive functioning. Numerous environmental influences will differ according to socioeconomic status, including stress, cognitive stimulation at home, pre and perinatal environment, and nutrition (Lipina et al., 2004; Mezzacappa, 2004). Another crucial sociodemographic factor is parental education (Ardila et al., 2005; Jacobsen et al., 2017). Along with the enhanced knowledge and information from the parental side, educational status is also linked to higher income levels, through which children and adolescents often have access to better educational resources, healthcare, and a more stimulating environment, which can positively influence their working memory, self-control, and cognitive flexibility. They may have opportunities for extracurricular activities and experiences that enhance skills such as time management and problem-solving (Ursache & Noble, 2016).

However, research suggests that the quality of parenting, including emotional support, consistent discipline, and the provision of a nurturing and stimulating environment, may have a more direct and immediate impact on children's executive functioning development compared to economic status. Parental support fosters emotional regulation, problem-solving skills, and impulse control, which are the essential components of executive functioning (Sosic-Vasic et al., 2017). Parenting styles incorporating warmth, responsiveness, and sensitivity foster EF among children, while authoritarian or permissive styles may hinder development (Blair et al., 2011; Ku & Blair, 2021). Healthy peer relationships are another factor that provides opportunities for children to practice social and emotional skills, which can, in turn, benefit executive functioning. Positive peer interactions can foster cooperation, communication, and self-regulation (Finch et al., 2019; Lecce et al., 2020). Besides, a positive relationship with teachers can promote executive functioning skills. Teachers who provide support, clear instructions, and a nurturing classroom environment can enhance cognitive and emotional regulation in students (Hernández et al., 2017; Yan et al., 2023).

Furthermore, Mothes et al. (2014) and De Bellis et al., 2013 demonstrated maltreatment, abuse, and neglect can significantly impair executive functioning by causing emotional trauma, disrupting neural development, and leading to difficulties in emotional regulation and decision-making among affected children and adolescents. While negative experiences can hinder the development of these critical cognitive skills, supportive and nurturing environments and appropriate interventions can help mitigate the negative effects and promote healthier executive functioning. Early identification and intervention for children who have experienced adverse parenting or maltreatment are essential to minimize long-term consequences.

Another social factor influencing executive functioning is an individual’s culture. Cultural variations impact how adolescents perceive and approach tasks that require executive skills, such as decision-making, planning, and problem-solving (Tran et al., 2019). For example, collectivist cultures may prioritize group harmony and conformity, influencing adolescents to consider the social implications of their decisions, whereas individualistic cultures may encourage more autonomous decision-making. Georgiou et al. (2020) found that the influence of executive functioning on academic achievement is mediated by cultural factors. Recognizing and respecting these cultural differences is essential when assessing and supporting executive functioning in adolescents to ensure that interventions are culturally sensitive and effective. Details regarding the studies mentioned in this section are given in Table 2.

Table 2

Summary of Research on Social Factors Affecting Executive Functioning

Author(s)	Participants	Design	Significant result(s)
Ku & Blair, 2021	Mothers and their children between 36 to 60 months	Latent profile analysis	Maternal sensitivity improves EF in children from low SES, without maternal mental health symptoms.
Piccolo et al., 2019	9- 18 years	Correlational research design	Academic support moderated the association between family income and EF.
Ursache & Noble, 2016	3–21 years	Correlational study	Family income moderates the white matter structure-cognitive flexibility association.

Blair et al., 2011	Birth- 36 months	Longitudinal study	Lower income, risky household environment (includes household density, safety, and noise levels), and hostile parenting are significantly related to executive functioning.
De Bellis et al., 2013	6 to 17 years	Experimental design	Sexual, emotional, and physical maltreatment or neglect during childhood is negatively associated with EF domains.
Mothes et al., 2015	12-18 years	Cross-sectional research	Childhood maltreatment resulted in lower cognitive flexibility and self-control scores.
Lipina et al., 2004	3 to 5 years	Cross-sectional research	A broad range of EF factors including cognitive flexibility, attentional control and goal setting are found to be negatively correlated with poverty.
Mezzacappa, 2004	4 to 7 years	Cross-sectional research	Males, older children, and socially advantaged children have shown better performance in EF tasks.
Sosic-Vasic et al., 2017	9 to 11 years	Cross-sectional research	Parental support positively influences EF
Tran et al., 2019	3 to 4 years	Cross-sectional research	Cultural influences influenced inhibitory control in children
Georgiou et al., 2020	6 to 7 years	Cross-sectional research	Working memory influenced reading and mathematics ability among Canadian students whereas both working memory and inhibitory control contributed in Chinese population.

Lecce et al., 2019	8 to 12 years	Short-term cross-lagged longitudinal design	Peer acceptance predicted working memory.
Finch et al., 2019	9 to 10 years	Cross-sectional research	Classmates' EF positively influenced individual students' EF.
Hernández et al., 2017	5 years	Longitudinal research	Teacher-student closeness mediated the relationship between effortful control and academic achievement.
Yan et al., 2023	3 to 6 years	Cross-sectional research	Teacher-child interaction positively influences EF.

Conclusion and Future Directions

This review summarizes current knowledge on various psychosocial factors related to EF in children and adolescents. It provides an overview of known relationships between the different variables of interest, studied using different research designs. Executive functioning, or the ability of a child to plan, organize, attend, and memorize, begins right from infancy and continues to develop through childhood and adolescence. Existing studies indicate the influence of several psychological factors like depression, anxiety, stress, and emotional regulation on EF. Social factors like socioeconomic status, parental support and warmth, peer interactions, relationships with teachers, and maltreatment during childhood were also found to influence EF. Additionally, cultural practices, educational systems, and socialization processes contribute to the development of executive functioning, potentially leading to variations in cognitive strategies and emotional regulation among adolescents from different cultural backgrounds.

The review followed a rigorous search approach among different electronic databases. One of the major implications of this study includes planning interventional strategies for children and adolescents. Even though interventions based on physical activities, dietary control, mindfulness, and computer-based training have been found effective in improving executive functioning, vivid awareness and consideration of different psychosocial factors influencing EF can help design specific individualized interventions and preventive measures. Interventions promoting overall health, such as maintaining a healthy lifestyle, avoiding substance abuse, addressing mental health concerns, and other protective factors, can improve executive functioning among children and adolescents.

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