



Research Paper

Review of the concept of executive function: Focusing on preschool

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Abstract

Aim: Executive functions are a set of higher order cognitive processes that manifest in purposeful behaviors and are widely used in everyday activities. These skills significantly develop in childhood, especially during preschool years. Therefore, their accurate recognition at this stage of life is really important. This review study was conducted with the aim to investigate the concept of executive functions with a focus on preschool ages. To this end, related theories, assessment tools, and their developmental characteristics in childhood were collected. For this descriptive study, we selected and reviewed 3939 English papers related to executive functions in the Scopus database. Our findings revealed two general views on executive functions. Furthermore, researchers agree on the importance of the formation and development of these cognitive processes in childhood.

Keywords: *Cognition, Executive Functions, Preschool*

Introduction

Childhood is called the golden age of one's life. Researchers believe that one of the components that emerge in early childhood and develops rapidly in the preschool years is executive functions (EFs) (Zelazo & Carlson, 2012; Serpel & Esposito, 2016). EFs are high-level cognitive processes such as reasoning, problem solving, and planning that are used to voluntarily control thought and action. This cognitive capacity grows slowly during childhood, peaks in adulthood, and declines in middle age (Overton & Lerner, 2010; Zelazo & Carlson, 2012). Attention to EFs during childhood and its outcomes for children's preparation for school, adaptation to school, and future educational success has been extensively researched, which emphasizes the importance of this influential cognitive component more than ever. Also, because of the emphasis on the importance of measuring EFs in children for diagnosing childhood disorders and subsequent adult problems (Carlson, 2005) and that the development of these skills is influenced by the environment (Serpel & Esposito, 2016; Carlson, 2005), one can take a step toward children's greater success by measuring EFs in preschool ages, promoting them, and enriching activities appropriate for these years.

The importance of accurate recognition of this basic cognitive component and the dramatic and increasing growth of various related research raised the need for a comprehensive study of this concept. Furthermore, there is a lack of accurate introduction and a coherent review of theories related to EFs among domestic research on EFs, especially in the early years of life, which is one of the most effective and golden periods for EFs. Therefore, this study sought to review the research on EFs and introduce this concept to better understand it in preschool age, and to answer these questions: What are the theories in this area? What tools are there to measure EFs? How does this cognitive component develop during childhood?

Methodology

This was a descriptive survey study. The statistical population comprised English papers on EFs. The keyword of "executive function*" was searched for in the Scopus database in the title of articles and the results were limited to the field of psychology. Of the 3939 articles found, those which received the most citations or were more recent, directly related to the study objectives, and focused on preschool were selected for analysis in the review study.

Results

The nature of EFs is controversial. Some believe in the unity of EF processing, while others argue for its dissociated components. In general, there are two developmental views on the EF framework.

Representational models

In this view, EF is considered a unified structure. Theorists in this group include Vygotsky, Zelazo, and Munakata. At the beginning of the emergence of executive functions, there was an agreement on the unity of its structure; but over time, theorists have come up with a different form of this fact through various studies.

Componential model

The second theoretical approach related to EF emphasizes its separate processes. Working memory, response control/inhibition, and cognitive flexibility are listed as the three cores of EF (Diamond, 2006; Miyake et al., 2000). Baddely (1986) defines working memory as a system that temporarily stores and manipulates information during cognitive activities such as comprehension, learning, and reasoning. Response inhibition includes the ability to control one's attention, behavior, thoughts, and feelings to overcome an inner desire or external temptation that leads to doing what is necessary or appropriate (Overton & Lerner, 2010; Diamond, 2013; Serpel & Esposito, 2016; Miyake et al., 2000). Cognitive flexibility is the third component of executive functions, which means the ability to switch between tasks or mental sets (Diamond, 2013; Serpel & Esposito, 2016).

Major age-related changes in executive functions occur between the ages of 3 and 5 years, with several activities defined to measure its various dimensions. Performance-based tasks and rating scales are the two main categories of these activities. In general, theories suggest EF development as an increase in conflict resolution capabilities (Overton & Lerner, 2010; Best and Miller, 2010). This conflict is either between hierarchical rules (Zelazo et al., 2003), between latent and active representations (Munakata, 2001), or between current representations and preset mental behaviors (Diamond, 2006), and they often emphasize the underlying role of neural network change.

Discussion and conclusion

EFs help keep information specific to an issue active in the working memory, ignore misleading data, and inhibit responses that hinder work-related goals. EF skills are activated in complex or new activities because

they require the application of new strategies and monitoring their effectiveness, while simple or routine activities are performed instinctively without activating executive processes. This study had some limitations, including the fact that addressing all theories and aspects of EF in a review article is really difficult given the extensive number of studies. Thus some theories or aspects related to EF could have been addressed insufficiently or could have been overlooked. It can be said that this research has provided useful and practical information for future research on EFs, especially in preschool age. Given the lack of related review studies, the present review provides a basis for progression in this field. It is recommended that further studies examine other theories, including neuroscience EF-related papers. It is necessary for educators, teachers, and those involved in educational settings to be aware of this important cognitive ability and to consider the requirements for strengthening EF components, to provide a rich environment to promote this higher order cognitive ability leading to the more academic and social success of children.

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