Review Article

Investigating the Relationship between Brain Executive Functions and Cognitive Psychology in People

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Abstract:

Background: The purpose of this research is to investigate the relationship between the executive functions of the brain and cognitive psychology in people.

Method: The current research method is a review, which was searched by examining the searched words, which are: executive function of the brain, cognitive psychology (in the data of Persian and Latin databases). A total of 32 articles, reports and protocols were found, and by removing similar and unrelated items and referring to updated reports, 21 studies were finally reviewed.

Results: The research findings showed that executive function refers to a range of mental skills that can be used to perform tasks and interact with others. However, any disorder and problem in executive functioning can affect people's ability to organize and manage behavior. Nervous, mental health and behavioral disorders (such as autism, Alzheimer's, depression and attention deficit hyperactivity disorder) affect the executive function of the brain. Diagnosing the cause of brain executive function disorders helps to identify treatment options such as cognitive psychologist. Chronic disorganization, lack of concentration, memory impairment and inappropriate social behavior are among the symptoms of executive function disorders. Of course, many causes of executive dysfunction are treatable. Cognitive psychology involves the study of the internal processes of the mind, meaning everything that goes on in your brain, including perception, thinking, memory, attention, language, problem solving, and learning. There are many applications related to this cognitive method, such as helping to deal with memory disorders, increasing accuracy in decision-making, finding ways to help people recover from brain damage, treating learning disorders, and organizing curricula to enhance learning.

Conclusion: Based on the findings of the research, cognitive psychology has a significant relationship with the executive functions of the brain, and people who suffer from brain disease can be treated by referring to such psychologists.

Keywords: Executive Functions of the Brain, Cognitive Psychology.

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Introduction

Definition of executive function: As humans, we are able to deal with new situations and flexibly adapt to changes. Cognitive skills that allow people to control and regulate their behavior are called cognitive functions (1). Definition of executive function: The human brain has two types of cognitive functions, one is non-legal functions that are based on emotions, desires, social cognition and situational influencing factors, and the other is law-based functions that regulate and control a person's thinking and performance and under It is known as executive functions (2). The relationship between executive function and the frontal lobe: these functions are mainly located in the prefrontal areas of the brain with numerous neural connections with other cerebral cortex and brain stem, however, it should be noted that the damage in the frontal lobe areas directly It does not affect specific cognitive or language processes, but this also affects their regulation and effective use, so executive functions are essential skills for mental and physical health, academic and career success, success in life, are the social and cognitive development of people and failure in it causes behavioral and emotional problems such as depression, hyperactivity, restlessness, failure to initiate and inability to restrain inappropriate responses, loss of efficiency and inability to perform daily activities. (3). Definition of executive function: Executive function includes three internal parts, which are control, cognitive flexibility, and working memory (4). Control is the ability to resist doing something impulsive in order to do the right thing. This power helps people to pay more attention, do less work and focus on them (5) Working memory is the ability to retain information in a space of the mind that can be used to perform cognitive tasks such as the relatedness of the subjects, deciding on the priority of tasks and mental estimation are appropriate. Cognitive flexibility includes constructive thinking and flexible adjustments to changing demands. This skill helps people to use their imagination and creativity to solve problems. Teaching these skills empowers people to pay attention, focus, make decisions and organize, plan, perform relevant tasks in the best way and remember details (6). Definition of executive function: As a result, executive functions can be considered the ability of cognitive flexibility and the ability to manage intervening components in goal-oriented behaviors and predicting the consequences of a performance (7). Definition of executive function: a group of researchers to explain the executive functions of the brain from the concept of how and why human behaviors and another group have defined it as the ability to plan and organize behavior, inhibit and inhibit response, continuity of performance, reduction of dominance and the ability to initiate performance (8). May or Kay et al provide evidence of dividing executive functions into three cognitive components including inhibition, transfer and updating, which plays a role in the process of regulating and controlling many functions. Another division of executive functions into main domains includes five components of immediate response control, planning, cognitive flexibility, attention transfer and working memory (9).

Definition of cognitive psychology: neurological studies and lesions of various neurological diseases and damage models have confirmed the place of executive functions. The science that has helped in the treatment of these diseases is the science of cognitive psychology. Cognitive psychology is a field that focuses on the science of how people think. This branch of psychology examines a wide range of mental processes, including how people think, use language, attend to information, and understand their environment. The field of cognitive psychology is both broad and diverse. It touches many aspects of daily life. There are many practical applications for this research, such as providing help to deal with memory disorders, better decision making, recovery from brain damage, treatment of learning disorders and the structure of educational curricula to enhance learning (10). This science

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has made an important contribution to the treatment of mental illnesses, brain injuries and brain erosive diseases. With the help of cognitive psychology, we can create ways to measure human intellectual abilities, prepare and create new strategies to fight memory problems and decipher the functioning of the human brain, all of which will ultimately affect the way cognitive disorders are treated. According to the presented materials, the main question of the current research is whether there is a significant relationship between the executive functions of the brain and cognitive psychology in people. Until now, the concept of executive functions of the brain, universal conceptualization (definition of 5 experts of executive functions) and common among scholars has not been presented. For this purpose, following the analysis of the studies, in table 1, the most prominent conceptualizations of the executive functions of the brain is presented.

Definition of executive functions: In fact, executive functions include a set of important abilities such as attention, working memory, decision-making, self-initiation, strategic planning, response inhibition, cognitive flexibility, impulse control, and academic activities. It includes and helps humans in life and doing learning tasks and intelligence actions (11). These functions are responsible for judgment, decision making, desire control, risk assessment and other brain functions (12). Situations of activation of executive functions: Norman and Shallis (1992) described five types of situations in which routine activation will not be enough for optimal performance and it is in these situations that executive functions should start to operate: 1) situations that includes planning or decision-making; situations that involve correcting an error or problem in everyday life problems 2) Situations in which responses are not well practiced or contain new sequences of actions 3) Situations that are technically difficult 4) Situations that require overcoming a strong habitual response or resisting temptation (13). Definition of executive function: According to Foster (2001)(10), two different types of activities are considered for executive functions under the title of metacognitive executive functions and emotional-motivational executive functions. Metacognitive executive functions include problem solving, abstract thinking, planning, attention, and working memory. In other words, the term cold executive functions is also used to describe metacognitive functions. Emotional-motivational executive functions that are responsible for matching cognition and emotion mean the ability to satisfy basic impulses by socially friendly solutions. Also, the term warm executive functions is used to describe this function. In fact, experts have divided the processes of executive functions into two parts, cold and warm functions (14). Definition of executive function: planning functions, cognitive flexibility, working memory, behavior monitoring and control of cold processes are called executive functions. Because the cognitive processes related to them do not tend to be highly emotional and are relatively logical. Hot functions support behaviors that require emotional awareness and regulation of social behaviors of a person and decision-making with emotional and personal interpretation and empathy (15). Studies have shown that impairments in the "cold" or "hot" components of executive functioning may have detrimental effects on people's daily activities such as the ability to work and attend school, function independently at home, or develop and maintain relationships (16).

Cognitive psychology

Definition of cognitive psychology: Cognitive psychology is a branch of psychology that focuses on the way people process information and is a knowledge related to the way we think and is related to internal mental processes such as attention, perception, memory, planning for action and language. Each of these components is central to the formation of who we are and how we behave (17). Definition of cognitive psychology: This science includes the study of mental and internal processes: everything that goes on in your brain, including perception, thinking, memory, attention,

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language, problem solving and learning (18). Although cognitive psychology is relatively new, it has grown rapidly and become one of the most popular subfields. Cognitive psychology became prominent and popular during the 1950s and 1970s. Before this time, behaviorism was the dominant view in psychology. Then, instead of focusing on behavior alone, researchers became more interested in the internal processes that influence behavior. This change is often referred to as the cognitive revolution in psychology. During this time, a lot of research was done on topics such as memory, attention and language learning. And finally, cognitive psychology became more common after the 1950s as a result of the cognitive revolution. In 1967, a psychologist named Ulrik Neisser introduced the term cognitive psychology, which he defined as the study of processes related to perception, transformation, memorization and retrieval of information (19). The effect of CBT cognitive therapy (cognitive therapy and cognitive psychology are two different fields) on increasing executive function: there are countless practical applications for this cognitive research. Including providing help to deal with memory disorders, increasing accuracy in decision-making, finding ways to help people recover from brain damage, treating learning disorders, and creating educational curricula to enhance learning. Gaining more information about how people think and process information not only helps researchers to have a deeper understanding of the functioning of the human brain. Rather, it allows psychologists to create new methods to help people deal with mental problems. For example, by recognizing that attention is both a selective and limited resource. Psychologists are able to find solutions which makes people with problems to be able to concentrate better. Findings from cognitive psychology have also improved our understanding of how people form, store, and recall memories. By knowing more information about how these processes work, people can create new methods to help people improve their memories and deal with possible memory problems (20).

Review of Literature

The relationship between executive function and mindfulness: Esmaeili moghadam et al (2022)(22), a review of the executive functions of the brain and its relationship with mindfulness, in recent years, extensive and significant studies have been conducted regarding the relationship between the executive functions of the brain and mindfulness. According to observed research, mindfulness training briefly increases visual-spatial processing, memory performance, and executive functions. Teaching mindfulness exercises improves executive functions such as working memory and verbal fluency and increases self-regulation. In mindfulness intervention, people learn to focus on continuous attention and it helps people to decide what kind of goals or activities to pay attention to and to organize and plan the behaviors according to it, which is one of the significant consequences. This intervention is to increase executive functions. In order to review the relationship between the executive functions of the brain and mindfulness, this article describes the concept of the executive functions of the brain and mindfulness and the studies conducted on the relationship between the executive functions of the brain and mindfulness (21). The relationship between executive function and electronic learning: Saadatmand et al., (2022), structural equation model of brain executive function and electronic learning of student teachers of Farhangian University, findings showed that there is a relationship between brain executive function (self-management, self-organization, self-motivation, and emotional self-regulation) and electronic learning. There is a significant relationship at $p>0.05$ level. In order, self-organization, self-motivation, emotional self-regulation showed a significant relationship on electronic learning. By improving the efficiency of the educational system, which depends on the academic progress of students, it needs to improve the executive function of the brain and the

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cognitive ability of students (22). The relationship between cognitive rehabilitation and executive functions (which this research model fits with the title of this article): Dana et al., 2019, the effectiveness of brain cognitive rehabilitation interventions on executive functions in children with attention deficit and hyperactivity disorder, the method of conducting this research is semi-experimental and practical in terms of purpose, which is accompanied by the use of a pre-test-post-test design. It was done with the control group. 30 children with attention deficit hyperactivity disorder participated in this research. In the pre-test stage, selective attention test was performed on all the participants using the Stroop effect test in the psychological non-response period. Then the participants were randomly divided into two experimental and control groups of 15 people. The experimental group was subjected to brain cognitive training intervention for 12 one-hour sessions during 4 weeks (3 sessions per week). During this period, no interventions were made in the control group. After the end of the intervention period, a post-test was taken. The data were analyzed by analysis of covariance and SPSS software version 22. The results showed that brain cognitive intervention has an effect on focused selective attention (23).

The relationship between cognitive rehabilitation and executive functions (which this research model fits with the title of this article): Mohammadi et al., (2018), the effectiveness of cognitive rehabilitation after drug therapy on the executive functions of the brain and behavioral symptoms of children with ADHD in Ahvaz city. The results showed that cognitive rehabilitation after drug therapy has a positive effect on the executive functions of these children and improves those functions. Conclusion: Therefore, it can be concluded that the method of cognitive rehabilitation after drug therapy among children with attention deficit hyperactivity disorder is an effective method for treating this disorder and improves the treatment process (24).

Methods

The current research is descriptive and a systematic review. In this method, a systematic review of the scientific findings of studies conducted in Iran in the field of cognitive psychology and brain executive function has been done. The results of researches published in Springer, PupMed, Google Scholar, Science direct, Google ProQuest Scopus, Magiran, SID, Normags, Irandoc and Civilica databases were analyzed. The key words of cognitive psychology and brain executive function were searched in the mentioned databases. After reviewing the articles that met the criteria for entering the research, they were used for the final review. Researches that had the searched keywords and were related to the relationship between cognitive psychology and the executive function of the brain were included in the research. These articles had text related to the research topic and were published in reputable journals in 2017 to 2022. After that, 39 cases were initially found. Of these, 21 items related to the topic were selected. In the following, articles with repeated topics and articles of internal conferences of organizations were excluded from the research. Finally, 18 articles were included in the research and analyzed.

Discussion

(While repeating the definitions of cognitive function and cognitive psychology, in part of this conclusion, cognitive behavioral therapy and cognitive psychology are confused and its use in this text is misleading. The subject of the research has nothing to do with CBT cognitive behavioral therapy)

Executive functions are broad cognitive processes that play a role in guiding behaviors, especially when some behaviors are to be inhibited and others to be initiated. Recent research shows that executive functions are one-dimensional constructs that include various components of cognitive processes such as planning, persistence in reaching the goal, cognitive flexibility, abstract thinking, and acquisition of rules. Executive functions increase and decrease in terms of ability

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throughout life. The development of these functions begins in early adolescence, and over time, this process is reinforced by learning a variety of different skill sets. Therefore, it can be said that doing or not doing developmental and objective tasks of a child at different ages can predict the growth or lack of development of executive skills and functions. These functions are a complex brain ability and require the development of the nervous system, so these skills are not seen in the early years after birth, but gradually from the age of 11 onwards, which in Piaget's theory is the beginning of the stage of abstract thinking. Researchers consider this ability to be related to the frontal part of the brain and state that in developmental disorders, the first and most important area that suffers damage is the skills related to executive functions(25).

The executive functions of the brain are the activities that we do in our minds to create self-control and purposeful behavior and to have the necessary brain flexibility in difficult tasks. Since all the tasks of life and planning are done by the brain; therefore, defects in higher cognitive processes such as executive functions can cause defects in the following cognitive tasks: memory impairment, organization, not remembering daily tasks, inability to start doing something and finish it, forgetting rules, inability to do homework, failure to complete time-consuming tasks, and also the inability to control emotions. Now, if there is a disturbance in the executive function of the brain, it can affect a person's self-control, concentration, and relationships, and its symptoms seem to be similar to attention-deficit-hyperactivity disorder (ADHD), and these problems can be caused by many factors, including genetics, depression. , brain damage and drugs and has nothing to do with a person's level of intelligence. Diagnosing a brain disease or cognitive health problem can be scary and sometimes confusing. But it is important to remember that you can have an effective treatment plan for brain health and cognitive problems by working with a cognitive psychologist. The main subject of cognitive psychology is the study of the mind and cognitive processes using common scientific methods in the field of cognitive science and technology. Laboratory methods used by cognitive psychologists are very wide and include methods and techniques of neuroscience and functional imaging, behavioral and psychophysical methods, as well as neuropsychological measurement methods. By relying on these methods, cognitive psychology has achieved many successes in various fields such as perception, memory, learning, reasoning, judgment, decision making, thinking, intelligence and language.

These psychologists study the human mind, which is a fascinating network of thoughts, memories, and perceptions, and how these mental processes may influence human behavior. In fact, there is a connection between the executive function of the brain and the cognitive psychologist. The cognitive perspective in psychology focuses on how thinking, emotions, creativity, and problem-solving abilities interact to determine how and why you think. The main goal of cognitive psychology is to study how the human mind receives and functions from knowledge and information. More precisely, it can be said that its performance is just like a computer processor. Therefore, by referring to a cognitive psychologist, you can find a useful way to treat diseases of the executive function of the brain, which cause a series of repeated and continuous behavioral patterns and seriously affect a person's performance and daily life. The exact cause of these mental illnesses is not known, but factors such as chemical imbalance in the brain, childhood experiences, heredity, stress, diseases, etc. can play an effective role in their occurrence. When a person is involved in mood, cognitive, behavioral problems for a long time, he/she should see a psychologist to be evaluated psychologically, because as a result of these examinations, a mental disorder may be diagnosed in the person. Most of the people get better by taking appropriate treatments, but their disease

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may recur from time to time, which does not cause any problems if they are monitored.

Conclusion

According to the topic of our current research on the relationship between cognitive psychology and the executive function of the brain that we studied, I came to the important conclusion that there is a relationship between two variables, in fact, when you have mental disorders or psychological diseases that include: personality disorders, mood disorders, psychosis, sexual, neurodevelopmental, bipolar, anxiety and stress disorders, physical symptom disorders, appetite, sleep, depression, destructive, substance-related disorders, neurocognitive disorders, obsessive compulsive disorders, you can see a cognitive psychologist. Because cognitive psychology deals with how to process, learn, remember, identify and use information in the brain. Therefore, when a person faces problems in the executive function of his brain, he can use this treatment method. With the help of cognitive psychology specialists, people can find ways to deal with and overcome problems. Therapies rooted in cognitive research help people change negative thought patterns, and replace these thoughts with positive, more realistic ones. Now, if this dysfunction of the executive function of the brain is not treated, it will lead to academic, legal, social, work, etc. problems. Excessive use of drugs, total intoxication, suicide, violent behavior, etc. are serious complications of not following up on mental disorders.

Conflict of interest

The authors declare that they have no conflict of interest.

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Table

Table 1: Most prominent conceptualizations of the executive functions of the brain is presented

Researcher	Year	Definitions
Diamond	2013	Executive functions, which are also called executive control or cognitive functions, is a neuropsychological concept that refers to high-level cognitive processes. The main core of these functions includes: response inhibition, working memory and cognitive flexibility.
Samchmichel and Tang	2015	Executive functions are the processes related to the frontal lobes of the brain, which include the coordination and regulation of executive processes in the brain regions.
Chan et al	2018	Executive functions is an umbrella term for tasks such as planning, working memory, inhibition, mental flexibility, as well as initiating and monitoring performance.
Dawson and Goyer	2018	Executive functions define the higher processes required for planning and directing activities, including task initiation, execution, working memory, sustained attention, performance review, impulse control, and purposeful persistence.
Inglehart et al	2019	Executive functions are supervisory cognitive processes that support purposeful thoughts and behaviors.

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