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Investigate the Conceptual Framework for Developing Family-centered Early Interventions for the Cognitive Functions of 3 to 5 Year old Children

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Abstract: The purpose of this research was to investigate the conceptual framework for developing family-centered early interventions for the cognitive functions of 3 to 5-year-old children in Yasuj. Using the convenience sampling method, the researchers analyzed all the foreign and domestic studies conducted until 2018. Also, the snowball sampling method was used to select ten experts to evaluate the components. The data were analyzed by thematic analysis using Nvivo software. Data analysis revealed four organizing themes, including attention, memory, language, and executive functions. Seventeen basic themes that constituted the organizing themes were extracted to develop a family-centered intervention program for cognitive functions. The basic themes were maintaining attention, sustained attention, divided attention, focused and selective attention for the theme of the organizer of attention; visual, auditory and working memory for the theme of the organizer of the memory; expressive and receptive language for the theme of the language and basic themes of planning, emotional control, time management, flexibility, metacognition, response inhibition and organization for the theme of the organizer of executive functions. To validate the thematic model, the researchers designed a questionnaire and gave it to the second group of experts, and the coding reliability was confirmed by Holsti's method. This package can pave the way for parents of at-risk children and children with developmental delays. It can also help enhance the cognitive functions of normal children.

Keywords: Early intervention, Family-centered, Cognitive functions

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Introduction

Cognitive functions are high-level cognitive processes that help individuals perform life tasks at every stage of development. They are neural processes involved in acquiring, processing, storage, and utilizing information (Shettleworth, 2010). These functions are the link between the brain's behavior and structure and include a wide range of abilities, e.g., planning, attention, response inhibition, problem-solving, simultaneous task completion, and cognitive flexibility (Madrigal, 2008). Scientific findings revealed that these functions are formed during the child's developmental period; they appear from the earliest stages of growth (probably the end of the first year of life); they grow gradually, and significant changes occur in them from the age of two to five. According to the theory of cognitive complexity and control, the evolution of these processes can be understood by age-dependent growth and in the context of the maximum complex operations and rules that the child

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can formulate and use to solve the problem (Zelazo, Muller, Frye, Marcovitch, Argitis, & Bosveski, 2005). Interest in cognitive functions has recently increased, and efforts have been made to understand them more accurately (Hughes, 2011). Blair and Raver (2012) stated that children are different in terms of cognitive functions, which is much more evident with the age of children. It also shows that the environment also affects the development of cognitive functions in addition to neurological factors.

Researchers have recently used various quantitative and qualitative methods to assess the rate of cognitive development in children. What researchers considered in evaluations were standardizing and creating criteria in their normal assessments. Standard assessment of cognitive function is often the primary element of a comprehensive assessment in early childhood. A child's performance during the cognitive assessment may denote important concepts. Access to resources or treatment decisions and ability measurement can be determined based on information obtained from this cognitive assessment. Therefore, getting reliable, valid, and meaningful assessment results and appropriate interpretation of performance is necessary, which begins with the careful selection of tools based on technical conditions and purposeful application (Ellingsen, 2016).

While understanding brain development in the first five years of life has significantly improved (because significant technological advances allow for advanced visualization of brain structure and function), preschool children's assessment failed to keep pace with it (Baron & Anderson, 2012). Assessing early childhood cognitive ability is challenging for some reasons. For instance, growth changes occur most rapidly during the first five years of life and might be inconsistent in different areas. Furthermore, the behavior might be variable and more sensitive to environmental and situational factors. The development of different skills and abilities in childhood varies, and the rapid and often occasional growth of the central nervous system usually results in dramatic changes in cognitive ability over a very short period of time (Thomas, Thomas, Bosch et al., 2019). Accurate assessment of the concerns related to cognitive function is also tricky due to the limited number of instruments available for young children and the variability of child behavior in various contexts. On the other hand, neglecting this early assessment causes adverse consequences such as delayed identification of early ages delay and neuropsychological disorders. Such delays mitigate the effects of the intervention and early treatment situations that might compensate for deficiencies that become more evident during the primary school years. The possible explanation is that given the significant brain and cognitive development during this period, the preschool years are ideal for family-centered interventions (Baron & Anderson, 2012).

In timely intervention programs, all rehabilitation and educational services are used to develop the cognitive, language, sensory-motor, emotional-social, and behavioral skills of children under six years of age. In addition to children, these programs take the families into account (Malekpur, 2003). The crucial issue in providing the child and family assessment service is planning an appropriate program for each family and having the utmost engagement of parents (Abedi, 2008). Timely family-centered interventions represent a kind of supportive-educational system that attempts to support, rehabilitate, and educate the child and his family from birth or the first possible opportunity after identifying the child with special needs. Different terms were used for family-centered services, including focused family, family-centered, and family-based; however, family-centered is the most commonly used term (Tart & Hebert-Murphy, 2007).

The family-centered approach goes beyond integrating content about family-centered services into educational planning to engage family members in education and implementation and considers the family critical in ensuring children's health and well-being. That is why today, attention to growth-related services has shifted

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from a traditional child-centered model to a family-centered model (Barker et al., 2009). Family-centered intervention is based on family system theory, which determines family well-being based on the child's well-being and focuses on the strengths, resources, and capabilities of the child and family. This intervention was gradually developed from family system theory, i.e., based on the two principles of empowerment and help to give in the family-oriented philosophy (Dempsey & Keen, 2008). Empowerment includes professional communication with the family so that the family retains or acquires a sense of control over the situation and is receptive to the positive changes resulting from behaviors determined by the development of abilities and practices. Because the participation of family members in child care is one of the critical principles in family-centered empowerment, the therapist can provide the client and family members the opportunity to demonstrate the abilities and competencies necessary to meet the child and family's needs. To help individuals and families to take an active role, therapists should emphasize empowerment than helping. Empowerment causes self-confidence, the ability to achieve the goal, and a sense of control over life and change processes, as well as a sense of hope for the future (Teimouri, Alhani & Kazemnejad, 2014).

According to the Can Child Center for Childhood Disability Research, family-centered interventions are a set of values, attitudes, and approaches to intervention for children with special needs and their families that identify parents as experts in their children's needs and enhance the relationship between parents and service providers and support the role of the family in opting for the services provided to the child. In this definition, each family is unique, and its role in the child's life is always constant and is aware of the child's abilities and needs and cooperates with service providers to be informed of decisions about their child. To provide service in a family- centered approach, the strengths, abilities and needs of all family members are considered (Law, Hanna & King et al., 2003).

Remy and Remy (1998) stated that a wide range of activities is designed to enhance the child's growth and health, beginning with a comprehensive assessment of the child, the family potentials, and needs to provide services. The literature confirms that a timely intervention program during the early years of life improves children's growth and development and dramatically neutralizes the impact of risk factors, such as adverse economic and social conditions Makes (Reeves, 2003). In general, research shows that supporting a child's early growth and development has consequences for the child and his/her parents and prepares him/her for further learning and success in life. Postnatal development occurs when children interact with the objects in their surroundings because the environment, successes, and experiences significantly affect the child (Baron & Anderson, 2012). Given the importance of cognitive functions and the impact of timely interventions, the present study aimed to develop a family-centered intervention package for 3- to 6-year-old children's cognitive functions.

Material and Method

The present research was qualitative and inductive content analysis. The content analysis method used in this research is based on Attride-Stirling (2001) thematic analysis method, which identifies themes inductively and is based on the basic themes, organizing themes, and universal themes approach. This method deals with the position and type of themes in the thematic network and converts scattered and varied data in the text into rich and detailed data. In this regard, to develop the family-centered interventions package, the previous literature (Table 1) was studied by researchers, and the components related to the purpose of the research

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were identified. The components and the factors that strengthen 3-to-5-year-old children's cognitive functions were extracted and coded by Nvivo. Furthermore, if similar themes existed in the literature, they were used for coding the themes of this study. The identified codes were combined based on the degree of conceptual similarity and were identified as free nodes by the software. Finally, the identified themes were categorized and sorted into basic, organizing, and universal themes based on the researchers' perception. The themes were then refined several times. Some were removed or added to draw a thematic network consisting of a universal theme of cognitive functions and organizing themes of attention, memory, language, and executive functions, as well as their basic themes (Figure 1).

Results

The themes were identified and extracted by reviewing the literature (Table 1). As can be seen in Table 1, the extracted components include four organizing themes and 17 basic themes, namely attention organizing theme (including the basic themes of focused attention, selective attention, sustained attention, divided attention, and maintaining attention), memory organizing theme (including the basic themes of visual and auditory memory), language organizing theme (including the basic themes of receptive and expressive language) and executive functions organizing theme (including the basic themes of planning, affective control, time management, flexibility, metacognition, response inhibition, and organization).

Organizing themes

Consistent with the primary aim of the research, which was identifying and extracting the components of timely family-centered interventions for cognitive functions of 3-to-6-year-old children, four organizing themes were extracted, each of which is discussed below:

Attention organizing theme: Studies have shown that most children with cognitive dysfunction are significantly weaker in planning and attention than their healthy peers. They also perform poorly on both consecutive and simultaneous process scales than normal peers and are expected to more likely drop out of school than normal peers (Kirby & Das, 2005).

Memory organizing theme: The first thing to note is that memory evolves, and as children get older, they use their memory more effectively and efficiently. The second characteristic of memory is that memory comprises different skills. For example, recognizing a person by face is a different memory function compared with preparing for an exam. Both are remembering; however, each demonstrates a different memory skill (Buchanan & Adolph's, 2002). The point is that memory is not a separate process or structure, yet it is an appropriate explanation for a set of cognitive processes. Memory evolution is also a combination of changes in each of several memory components. The third characteristic of memory is that memory is not a separate intellectual skill but is closely involved in many of the child's intellectual and social endeavors. Memory also plays a crucial role in the complex activities of reading, comprehension, arithmetic, and academic ability (Meltzer, 2018). Regarding memory functions, some researchers have introduced memory as the most sensitive and psychologically influential component of cognitive functions (Eriksson et al., 2015). It should also be noted that memory is very closely related to learning and is even defined in some cases, according to it (Hosseinali zadeh et al., 2019).

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Table 1. Universal, organizing, and basic themes

Cognitive functions	Attention	Maintaining attention	Rothbart and Sheese (2007) Bodrova and Leong (2007)	Buchanan & Adolphs (2002)
		Sustained attention	Jafari et al. (2015) Kasaeian et al. (2014)	Dillon and Pizzagalli (2007)
		Divided attention	Jafari et al. (2015) Boustanzar and Rezayi (2017)	Aksan & Çelikler (2009)
		Focused attention	Rey et al. (2015) Boustanzar and Rezayi (2017) Emadifar et al. (2017) Bayrami et al. (2017)	Bayrami et al. (2017) Dillon and Pizzagalli (2007) DeShazo Barry et al. (2001)
		Selective attention	Tamboer et al. (2016) Akhavan Tafti(2013) Jafari et al (2015)	Quinn (2010) Julvez et al. (2007)
	Memory	Working memory	McInnes et al. (2003) Barkley (2013) Kasper, Alderson & Hudec (2012)	Loosli et al. (2012) aMilton (2010)
		Visual memory	Boros et al. (2016) Rendall et al.(2017)	Afsharian et al. (2014) Bogdanowicz et al. (2014)
		Auditory memory	Rendall et al. (2017) Delavarian et al. (2016) Männel et al. (2015)	Bogdanowicz et al. (2014) Kita et al. (2013) Quinn (2010) Ghorbanpour et al. (2013)
	Language	Expressive language	Payne& Isaacs (2017) Dispaldro et al. (2013) Mohammad Esmaeilzadeh et al. (2015) Chen& Chang(2004) Ping (2014) Roberts et al. (2014)	Quinn (2010) Abedi and Hesam (2014) Faramarzi et al. (2015) Makarem- Nasab, Ghamrani, and Yarmoham-madian (2017) Bagheri, Abbasi, and Geramipour (2016) Ebrahimi et al. (2016)
		Receptive language	Şimşek and Işıkoğlu Erdoğan (2015) Mousavi and Gholami (2014) Faramarzi et al. (2015) Mohammad Esmaeilzadeh et al. (2015) Abedi and Hesam (2014) Kakojoibari and Sharifi (2012) Quinn (2010)	Delphi et al. (2013) Thomsena (2003) Bojczyk et al. (2016) Verhoeven and Perfetti (2011) Abedi, Shahmivah, Momeni et al. (2012)
	Executive functions	Response inhibition	Arghavani Pirsalami et al. (2017) Aziziyan et al. (2017). Asgari Nekah and Abedi (2014)	Kavianpour et al. (2013) Tseng and Gau (2013) Hakimi Rad et al. (2014)
		Planning	Kitty et al.)2002) Davenport et al. (2010)	Qiu et al. (2011)
		Organization	Aziziyan et al. (2017) Asgari Nekah and Abedi (2014)	Narimani et al. (2013)
		Time management	Dowson(2017) Kitty et al.)2002) Davenport et al. (2010)	Qiu et al. (2011)
		Flexibility	Barkley (2003) Barkley (2006)	Barkley (2013)
		Purposefulness	Sadock(2015) Bussing et al. (2012)	Finzi-Dottan et al. (2011)
		Metacognition	Bussing et al. (2012 Anastopoulos & Shaffer(2007)	Resnick(2005) Gatica et al. (2013)
		Affective control	Becker et al. (2014)	Miller et al. (2012)

Language organizing theme: Children with language delay have differences in several aspects, including the

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communication process, the clarity of its purpose, and the response rate, compared with normal children, all of which make their interaction different from their normal peers (Roberts, 2011; as cited in Hosseinali zadeh et al., 2019). Language, as the primary tool of human communication with other people in society, plays a significant role in the child's mental development. Language has a dual function; that is, it is both a means of cognition and thought and a means of communication and social life. Delays in language development can affect other developmental functions of the child. The most obvious effects of language developmental delays are delays in learning, neuropsychological problems, and socio-communication problems. Even the most acute state of learning disability is related to language, and language delay is seen in the history of these disorders (Yarmohammadian, 2013).

Executive functions organizing theme: Executive function construct is an umbrella term for various cognitive processes that serve purposeful behavior and actions (Lezak & Howieson, 2009). Children who suffer from cognitive dysfunction face significant problems with executive functions, especially planning and organizing, working memory, and inhibition (Endlich, 2001).

Validation of the developed package

Independent coding was used for validating the developed package. This method is commonly used for evaluating and controlling the quality of the content analysis. In the positivist approaches of qualitative research, independent coding is equal to the statistical estimation of internal reliability performed in quantitative content analysis or structured observation (King & Horrocks, 2010). To estimate the validity of the present study, besides reviewing the literature and extracting themes (basic, organizing, and universal themes), the opinions and guidelines of a group of experts were taken into account. For this purpose, the experts were requested to introduce the major topics based on their work and research experience. Then, their reports and data extracted from Nvivo software were reviewed, and the reliability coefficient was calculated using Holsti's method, whose formula is as follows:

$$PAO= 2M/ (n1+n2) = 2.210/210+227= 0.8$$

PAO means the percentage of agreement observed (reliability coefficient); M is the number of accords at the coding site; n1 is the number of units coded in the first stage, and n2 is the number of units coded in the second stage. The PAO value varies between zero (no agreement) to one (full agreement). Therefore, the above calculation shows that the research results are highly reliable. Finally, a network of themes was drawn, which can be seen below (Figure 1).

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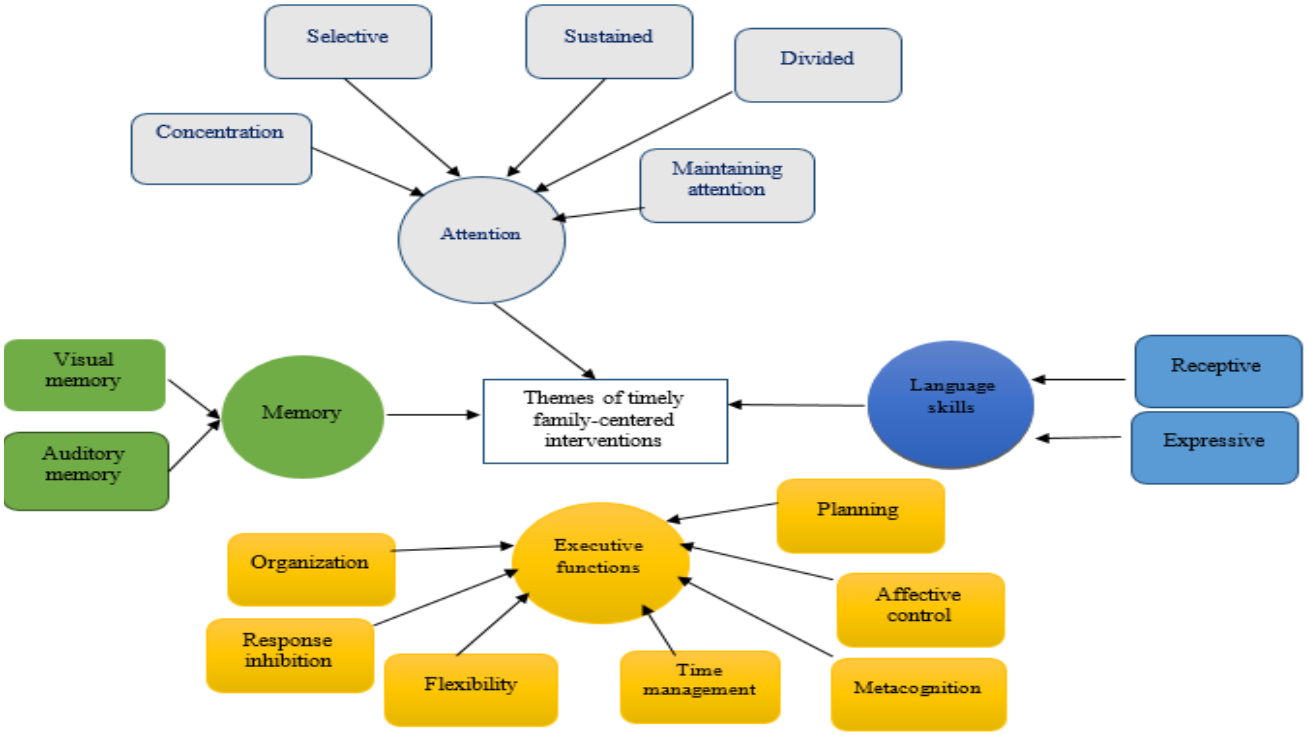

Figure 1. Thematic Network

Discussion

This study aimed to design and develop a timely family-centered interventions package specific to the cognitive functions of children aged 3 to 6 years. The themes of timely family-centered interventions specific to the cognitive function of children aged 3 to 6 years were obtained by analyzing several Persian and English articles in which different elements of cognitive development were investigated. The most prominent elements were selected and validated using experts' opinions. Finally, the thematic network was drawn in four organizing themes (attention, memory, language, and executive functions) and 17 related basic themes.

According to the results of the studies mentioned in the previous section, it can be concluded that at-risk children experience difficulty in cognitive functions and, in many cases, have delays in some or all components of cognitive function. Cognitive functions enable humans to understand concepts, solve problems, pay attention, memorize, and make decisions, and delays in this area can seriously impair an individual's daily life (Poon-McBrayer & Wong, 2013). Moreover, defects or delays in cognitive functions can largely affect an individual's function, including (a) slower processing speed; (b) shorter attention span; (c) difficulty in problem-solving and abstract thinking; (d) problems and slowness in storing and retrieving information (Hosseinali zade & Faramarzi, 2019).

On the other hand, neglecting children's initial examination has adverse effects such as late identification of early ages' delays and psychological, neurological disorders. Such delays mitigate the intervention's impact and early treatment situations that might compensate for deficiencies that become more evident during the primary school years. The possible explanation is that given the significant brain and cognitive development during this period, the preschool years are the ideal age for family-centered interventions (Baron & Anderson, 2012). Timely family-centered interventions represent a kind of supportive-educational system that attempts

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to support, rehabilitate and educate the child and his family from birth or the first possible opportunity after identifying the child with special needs (Tart & Hebert-Murphy, 2007). Therefore, the present study package also identified and extracted the components of children's cognitive functions, considering the flexibility of children's brains at a young age and also the importance of enriching their environment, especially under the age of six, and provided training and games to strengthen them.

Therefore, as this package was designed and developed using a scientific method and the related literature, it is expected to be useful for the cognitive functions of children aged 3 to 6 years. This package can also help kindergarten teachers, counseling centers, providers of psychological services, and organizers of parent-child workshops who work with children and their families. One of the limitations of this study was that researchers could not ensure whether all the themes related to children's cognitive functions were identified and extracted.

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