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Listening Comprehension Skills in Children with Attention Deficit and Hyperactivity Disorder: A Review Study[1]

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Abstract

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity and impulsivity that may begin in early childhood and continue into adolescence and adulthood and are incompatible with the developmental level of the individual. Most children with ADHD are at risk of facing significant academic problems throughout their educational life. In recent studies aiming to reveal the causes of academic problems experienced by children with ADHD, academic problems have been associated with the difficulties in reading and listening comprehension skills of children with ADHD. The relatively common prevalence of ADHD, the extent of academic problems experienced by children with ADHD, and the lack of clarity about reading difficulties require further examination of the relationship between ADHD and reading and listening comprehension skills, which are often based on the same language and cognitive skills. Listening comprehension, which is defined as the ability to understand, interpret, organize, and evaluate the ideas and thoughts in a speech heard or a text read aloud, is one of the most important early literacy skills necessary for the ultimate goal of reading, which is reading comprehension. In this review study, listening comprehension skills of children with ADHD were discussed together with the literature.

Keywords: Attention deficit and hyperactivity disorder, early literacy, listening comprehension

[1] This study is based on the first author's Ph.D. dissertation entitled "The Effectiveness of the Dialogic Reading Method on the Listening Comprehension Skills of Children Attending Kindergarten with Attention Deficit and Hyperactivity Disorder", completed in 2023 under the supervision of the second author.

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INTRODUCTION

Attention deficit and hyperactivity disorder, which can begin in early childhood and continue in adolescence and adulthood, and is incompatible with the person's level of development, is a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity, and impulsivity. Individuals diagnosed with ADHD may experience problems in areas such as cognitive processes, emotional and behavioral regulation, and interpersonal relationships, and these problems negatively affect areas of functionality such as family and peer relationships and academic success (APA, 2013). Although ADHD was identified by researchers many years ago, its prevalence has recently been attempted to be revealed through studies conducted in different countries. Although the research results in the literature on the prevalence of ADHD vary, it is estimated that the worldwide prevalence rate of ADHD is between 3 and 10 percent in school-age children and 4 and 5 percent in adults (Bitsko et al., 2022; Buttross, 2009; Jacobs and Miles, 2011; Wender, 2001). Similar to many disorders that affect the development of the central nervous system, the prevalence and nature of ADHD differ between boys and girls.Particularly by school age, boys are three to four times more likely to be diagnosed with ADHD than girls (Bitsko et al., 2022; Jacobs and Miles, 2011; O'Brien, et al., 2010; Wender, 2001).

In addition to the physiological, psychological, and social effects of ADHD, which is characterized by inattention, hyperactivity and deficits in impulse control, another important effect on children is in the academic field. Most children with ADHD are at risk of facing significant academic problems throughout their education. Academic difficulties that children with ADHD may face are mostly about the presence of disruptive behavior during learning activities in the classroom (difficulties in completing tasks within the specified time, the need to move around, etc.) and patterns of behavior that predict the risk of exclusion from school (difficulties in relationships with adults and peers). In addition, a significant portion of children with ADHD have deficiencies in reading, spelling, mathematics, writing, and language (Barkley, 2015; Cain and Bignell, 2014; Frazier et al., 2007; Miller et al., 2013; Sims and Lonigan, 2013). Children with ADHD, especially due to attention deficit, experience learning difficulties, and perform worse than their peers on standard tests, and for these reasons, many of them repeat grades and face the risk of dropping out of school or being suspended (Frazier et al., 2007, Hayden et al., 2018; Niu et al., 2021).

It does not seem difficult to prove that children with ADHD show poor academic performance in school. However, it is not so easy to explain why these children perform so poorly at school (Lorch, O'Neil, Berthiaume et al., 2004). In the literature, there are many studies that aim to reveal the reasons for academic problems experienced by children with ADHD. (Adams and Snowling, 2001; Bauermeister et al., 2005; Cain and Bignell, 2014; Carroll et al., 2005; Denton et al., 2020; Hayden, 2018; Lamminmäki et al., 1995; Lorch et al., 2004; McGee et al., 2002; Sims and Lonigan, 2013; Willcutt, Pennington and DeFries, 2000; Willcutt and Pennington, 2000). Most of these studies focused primarily on children's learning difficulties caused by attention deficit and understanding the relationship between ADHD and reading ability (reading difficulty).

However, these studies investigating the relationship between ADHD and reading skills focused on clinically diagnosed, school-age and adolescent children. Few studies have addressed the early developmental link between inattentive and hyperactive/impulsive behavior and academic problems in the preschool years. For these reasons, in contrast to the evidence regarding the link between behavior and academic skills in older children, little is known about this link in the preschool period. The reason for this lack of interest may be the view of some researchers that there may be no relationship between ADHD and early literacy skills in preschool children because attention and restraint are not required to participate in learning activities in which preschool children acquire early literacy skills. However, this does not appear to be the case. Children in preschool programs are expected to acquire basic skills that closely reflect the behaviors needed to succeed and benefit in formal education settings. Children who cannot acquire these skills may not be ready to learn in structured learning activities (Sims and Lonigan, 2013).

Recent studies aiming to reveal the reasons for the academic problems experienced by children with ADHD (Aram, Bazelet, and Goldman, 2010; Hayden, 2018; Miller et al., 2013; Sims and Lonigan, 2013; Velting and Whitehurst 1997) are seen to focus on early literacy skills that emerge during the pre-school

period, which predict the ability of children to acquire the skills of reading and writing, their reading competency and their future academic success at school. Research conducted in this context (Aram et al., 2010; Lonigan et al., 1999; Velting and Whitehurst, 1997) provides evidence that there are strong connections between ADHD, which includes inattentive and hyperactive/impulsive behaviors, and early literacy skills. In these studies, the difficulties experienced by preschool children with ADHD in reading and listening comprehension skills were associated with their academic problems (Cain and Bignell, 2014; Flake et al., 2007; Flory et al., 2006; Lorch et al., 2004; McInnes et al., 2003; Miller et al., 2013; Renz et al., 2003; Schmiedeler and Schneider, 2014; Zentall, 1988). Furthermore, there are research results in the literature which exert that children with ADHD also experience difficulties in other early literacy skills such as vocabulary, letter/alphabet knowledge and phonological awareness, in addition to reading and listening comprehension skills.

The relative prevalence of ADHD, the extent of academic problems experienced by children with ADHD, and the lack of clarity regarding reading difficulties require further examination of the relationship between ADHD and reading and listening comprehension skills, which often rely on the same language and cognitive skills. At this point, listening comprehension skill, which is one of the early literacy skills that is very important for the academic success of children with ADHD, stands out.

Early Literacy

The literacy process from birth to the period when the child transitions to formal reading and writing is called "emergent literacy" or "early literacy" (Cabell et al., 2015; Hume et al., 2016; Makin and Whitehead, 2004; Nutbrown, 1997; Teale and Sulzby, 1992; Whitehurst and Lonigan, 1998). Early literacy; is expressed as all the prerequisite knowledge, skills, and attitudes regarding reading and writing that children are expected to acquire in the preschool period before starting formal reading and writing education (Sulzby and Teale, 1991; Teale, 1987; Whitehurst and Lonigan, 1998). Many researchers view these prerequisite skills as the beginning of a developmental process that begins early in life and continues as children enter the school environment (Whitehurst and Lonigan, 1998).

Research conducted in the field of early childhood education is of great importance in the development of the early literacy approach. Research has made significant contributions to understanding how literacy is learned and how it can be better taught. Fundamental research on early literacy development has taught us much about the stages in which children progress from early exploration to later skills on the path to becoming literate. However, it can be said that research on early literacy development has progressed irregularly. While the focus of early research was on the importance of using books in the development of children's early literacy skills, the focus of subsequent research was on the development of writing. Later studies focused on children's perceptions and abilities in learning to recognize and read some environmental texts. Oral language has also been a constant focus of attention, although at different times the emphasis has been on different aspects (such as conversation, storytelling, or phonological awareness) (Nutbrown, 1997).

Although there has been a large consensus in the early literacy literature in recent years about what the skills that will form the basis of children's successful literacy should include, there are different approaches to the classification of these skills (Cabell et al., 2015; Majorona et al., 2021; Neuman, 2014; Roskos et al., 2012; Whitehurst and Lonigan, 1998). Five prerequisite skills, which are widely accepted in the literature as early predictors of a successful literacy process, can be listed as follows. Th*is is Vocabulary*, which refers to vocabulary skills an individual can use speaking and writing in the expressive language and understanding what he listens to and reads in the receptive language (Read and Ghoting, 2015; Roskos et al., 2012), *Print Awareness*, which includes learning concepts such as awareness of the function of writing, learning the units that make up writing and the direction of writing (Whitehurst and Lonigan, 1998), and *Letter/Alphabet Knowledge*, which includes children's ability to quickly and accurately understand the shapes, names, and sounds of letters in the alphabet (Cabell et al., 2015; van Tilborg, 2018; Roskos et al., 2012; Whitehurst and Lonigan, 2001), *Phonological Awareness*, which is defined as the ability to separate words into syllables and syllables into sounds, and forming words by combining sounds by being aware of the phonemes of the spoken language regardless of meaning (Anthony and Francis, 2005; Whitehurst and Lonigan, 1998), and *Listening Comprehension*

skills (Hogan et al., 2014), which are expressed as the ability to understand, interpret, organize and evaluate the ideas and thoughts in a heard speech or a text read aloud.

Listening Comprehension Skills

Listening comprehension has an important place among early literacy skills before formal reading activity, especially since it is one of the prerequisite skills for reading comprehension, which will form the basis of future academic success (Asadi et al., 2022; Kargın, et al., 2015; Oakhill and Cain, 2007; Tompkins et al., 2013). An important part of the oral language skills that children have is listening comprehension. Listening comprehension, which includes both the understanding of individual words, phrases, and sentences, as well as broader elements of discourse (Jackson et al ., 2022), is also considered a higher level of oral language skill that enhances early literacy (DeVore, 2020). The listening comprehension skill, which begins at birth (perhaps in the womb) and develops long before formal reading instruction begins (Hogan et al., 2014), is an independent skill necessary for daily functioning at home and in the classroom, for example, to understand orally presented stories and complex instructions. In addition to contributing to academic success in the long term, considering its effects on reading comprehension (Alanzo et al., 2016), it is also critical for positive life experiences such as employability, income, and participation in society (DeVore, 2020; Hagen et al., 2022).

Listening comprehension involves the ability to analyze, integrate, and understand verbal input. Good listeners go beyond understanding a single word and sentence to build a mental model that integrates the multiple premises of a story and prior knowledge into a coherent whole. Listening comprehension utilizes the same linguistic processes used to understand language through text, but without the cognitive demands of having to decode text (figure out the meaning of words) (Hogan et al., 2014). In this sense, listening comprehension is more broadly seen as a necessary skill not only in the service of reading comprehension but also for other purposes in many different settings (e.g., understanding a story told at the dinner table or building a mental model while watching a cartoon on television), can be conceptualized (Kendou, et al., 2005). According to such an approach, listening comprehension is a complex process that results in a coherent mental representation of the meaning of a text. This meaning-making process requires the listener to apply linguistic and world knowledge to understand both the information explicitly presented in the text and the implicit knowledge that can be extracted from the text. Effective and good listeners can understand “what is said” and “what is meant” by using literal and inferential comprehension skills in this way (Florit et al., 2011).

Students who understand spoken language well in the first years of school life, where learning and teaching activities are mostly carried out through verbal communication, are likely to develop strong reading comprehension skills in later grades (Hwang and Cabell, 2021; Kim, 2016; Storch and Whitehurst, 2002). The assumption that listening comprehension is the essence of reading comprehension and that it contributes to children's later reading comprehension skills has been proven by many longitudinal research results.

In the literature, the results of many studies (Florit et al., 2014; Hjetland et al., 2017; Hogan et al., 2014; Kargın et al., 2017; Kim, 2016; Kendeou et al., 2005; Kendeou et al., 2008; Kendeou et al., 2018; Storch and Whitehurst, 2002) have revealed that there is a strong relationship between the listening comprehension skills that children acquire in the early period and their reading comprehension performance in primary and secondary school. Therefore, when designing approaches for early reading teaching, foundational language skills should be considered together. These results also support the assumptions of the Simple view of the reading approach put forward by Gough and Tunmer (1986; cited by Hogan et al., 2014). According to the simple reading view approach, reading comprehension is the product of listening comprehension and decoding. While decoding means encoding written material and being able to read written material fluently, listening comprehension means deciphering the meaning behind written or spoken language. Decoding and comprehension are interconnected because without decoding it is not possible to understand written text, and without comprehension, decoding is more or less useless. However, these two processes have different developmental paths and predictors (Ebert, 2020). According to this approach, although it is accepted that there are some differences, especially in the coding of visual and auditory stimuli, reading comprehension and listening comprehension are based

on the same comprehension processes. According to this view, once a child masters decoding skills, he or she will show similar success in understanding reading and listening texts (Florit et al., 2011; Kim, 2016). Contrary to this traditional view, which bases the success of listening comprehension skills development on foundational language skills, recent evidence has revealed that listening comprehension is not a simple skill, but benefits from multiple language and cognitive skills in addition to foundational language skills (Florit et al., 2011, Florit et al., 2014; Kendeou et al., 2008; Kim, 2015; Kim and Phillips, 2014; Tompkins et al., 2013).

Considering the importance of early listening comprehension skills in children's literacy journey, it is important to consider in detail the linguistic and cognitive skills related to the development of listening comprehension skills.

Components of Listening Comprehension

Despite their importance in a successful literacy process, comprehensive research on the component skills of listening comprehension has not received much attention until recently (Hagen et al., 2022; Hwang and Cabell, 2021). In the first studies on listening comprehension, it was assumed that the components examined in the context of reading comprehension also played a role in listening comprehension. These studies have focused on a few language and cognitive skills that provide limited evidence. However, recently, there have been studies in the literature aimed at understanding the multicomponent structure of listening comprehension skills in early childhood (Alanzo et al., 2016; Ebert, 2020; Florit et al., 2009, 2011, 2014; Fong and Ho, 2017; Kim, 2015, Kim, 2016; Strasser and del Rio, 2014; Tompkins et al., 2013). The results obtained in these studies have revealed that listening comprehension should be considered a complex and difficult process that requires more than vocabulary and understanding various word combinations and involves several cognitive and linguistic skills. According to such an approach, although basic linguistic skills (e.g. vocabulary) are necessary for listening comprehension, they are not sufficient for successful listening comprehension. Successful listening comprehension requires going beyond the meaning of individual words and sentences and creating a coherent mental representation of the meaning of the text. This is a complex multi-component process that requires both general cognitive and more specific language skills. This process is expressed in various stages and includes multiple components and resources, each of which has the potential to lead to individual differences in listening comprehension skills (Alanzo et al., 2016; Kim and Phillips, 2014; Oakhill and Cain, 2007).

Based on the research results, to demonstrate successful performance in listening comprehension skills, which are closely related to verbal language comprehension skills, children must have skills collected in three interrelated stages namely *foundational cognitive skills, foundational language skills, and higher-order cognitive skills*.

Foundational Cognitive Skills

Within the scope of foundational cognitive skills, children; attention, working memory and inhibitory control (Daneman and Merikle, 1996; Florit et al., 2009; Florit et al., 2014; Kim, 2016; Oakhill and Cain, 2007). These skills are also considered among the executive function skills of the cognitive system. Executive function skills emerge from the first year of life and develop gradually over a long period. They show significant development in childhood, especially in the preschool years, but do not reach full maturity until early adulthood (Gandolfi and Viterbori, 2020). For this reason, early childhood education has a critical effect on triggering high-level cognitive skills, especially working memory and attention. The observable difference in children's cognitive, social and emotional, motor development and academic skills in later years is related to the support of working memory and attention in early childhood. Attention, working memory and inhibitory control are related to each other, and the discussions on how they affect each other are discussed in the theoretical dimension and examined in the light of relevant research (Gözüm, 2020).

Working Memory

Working memory; it can be defined as the ability to store and process information in memory for a sufficient period to complete a task. Working memory is a mental workspace where incoming information is stored and manipulated simultaneously. Working memory is, in a sense, the key to how

efficient the listener is at retaining and processing information (Florit et al., 2014; Fong and Ho, 2017; Kim, 2016). Working memory, which involves the simultaneous storage and active manipulation of information, is considered a foundational cognitive skill that supports foundational language skills as well as higher-order cognitive skills such as monitoring comprehension and making inferences (Kim, 2015). Children are unlikely to perform well on any linguistic tasks or higher-order cognitive tasks if they do not have sufficient memory capacity to retain words and sentences as well as process their meaning (Florit et al., 2009). Working memory is crucial for text-based representation, which allows linguistic input to be held temporarily while processing and integrating new linguistic information, especially to form basic propositions and some initial inferences. In other words, while listeners access previously processed linguistic and semantic information, they must also be able to process incoming semantic input to establish connections between meanings, integrate them, and make inferences (Kim, 2016).

Working memory is a potential predictor of listening comprehension due to such demands placed on memory resources during listening comprehension tasks (Alanzo et al., 2016; Florit et al., 2009; Kim, 2015, 2016). Research findings also support the view that working memory is a critical component for listening comprehension and contributes to listening comprehension directly and indirectly through foundational language skills and higher-order cognitive skills (Florit et al., 2009, 2014; Kim, 2015, 2016; Jiang and Farquharson, 2018). For example, in the study conducted by Kim (2016), it was found that working memory and attention were moderately related to vocabulary and grammatical knowledge. It has also been shown that working memory, although weak, is directly related to higher-order cognitive skills, comprehension monitoring, inference, theory of mind, and listening comprehension. In another study conducted by Kim (2015), it was determined that the role of working memory in listening comprehension was partially mediated by higher-order cognitive skills such as theory of mind and comprehension monitoring.

Attention

Attention is another basic cognitive skill that is considered important for listening comprehension. Because listening comprehension requires focused attention to process significant grammatical information (Kim and Phillips, 2014). Defined as "the focusing of sensory, motor and/or mental resources on information-requiring aspects of the environment" (Sheridan, 2007; cited in Beattie et al., 2018), attention begins to develop in infancy and becomes more complex throughout childhood. While even very young babies can be selective in their attention, other aspects develop later in childhood, including the ability to shift attention to other directions. Attentional control refers to a person's ability to focus attention on relevant stimuli to solve a task, including the ability to shift attention from one stimulus to another when necessary (Blair and Diamond, 2008). Although there are very few studies in the literature that aim to reveal the relationship between attention and listening comprehension skills, some studies have revealed the relationship between attention and listening comprehension skills (Kim, 2016; Jiang and Farquharson, 2018; Strasser and del Rio, 2014). For example, in the study conducted by Strasser and del Rio (2014), the relationship between attention and story comprehension was examined for 6-year-old children. As a result of the research, it was determined that attention has a direct relationship with understanding the story. As a result of the research conducted by Kim (2016), it appears that the effect of attention on six-year-old children's listening comprehension, although the smallest among all language and cognitive skills included, may be indirect through foundational language skills and working memory. The study conducted by Jiang and Farquharson (2018) revealed that cognitive resources, including working memory and attention, are effective in predicting both reading and listening comprehension in the early grades (from kindergarten to third grade of primary school), and that their effect on listening comprehension is greater than on reading comprehension.

Inhibitory Control

Inhibitory control is a cognitive process that is included in many definitions of executive function and develops early in life. Inhibitory control is defined as the ability to prevent a dominant action that occurs outside the purpose or to suppress a sudden (automatic) behavior to show the appropriate behavior necessary to achieve a goal (Bettie et al., 2018). Similarly, inhibitory control was defined by Scrimin et al. (2017) as the ability to inhibit a dominant response and initiate a sub-dominant response, and

Diamond and Lee (2011) defined it as a person's ability to inhibit a dominant response in favor of a more appropriate response. Inhibitory control, one of several processes involved in the executive functioning of the cognitive system, plays an important role in determining how various mental processes work together in the successful execution of a task. Data on the role of this competence in children's listening comprehension in the preschool period are still quite limited but very promising (Wolf et al., 2019). Only a few studies (Kim and Phillips; 2014; Strasser and del Rio, 2014) have examined the effects of inhibitory control on listening comprehension. For example, Kim and Phillips (2014) found in their research that inhibitory control was a direct predictor of listening comprehension in children attending kindergarten and first grade students from impoverished schools.

Foundational language skills

The second stage skills that contribute to listening comprehension *are foundational language skills.* Within the scope of foundational language skills, children; they are expected to reach a certain level of competence in vocabulary knowledge, syntactic knowledge and skills and morphological awareness skills (Florit et al., 2009; Florit et al., 2014; Hogan et al., 2014; Kendeou et al., 2005; Nadig, 2013). Most of these skills are foundational language skills that develop relatively easily and quickly in early childhood and form the foundational for higher-order language skills (Alanzo et al., 2016; Florit et al., 2014; Kendeou et al., 2005; Kim, 2015, 2016).

Vocabulary knowledge

Foundational listening comprehension begins with the development of vocabulary. Regarding listening comprehension, it is known that it is one of the most important predictors of vocabulary knowledge (Cain and Oakhill, 2014; Florit et al., 2011; Wolf et al., 2019). The more children know the meaning of the words they hear, the more accurately they can make inferences from verbal messages, resulting in better listening comprehension (DeVore, 2020; Hogan et al., 2014; Hwang and Cabell, 2021). Vocabulary knowledge/repertoire can be examined in two ways: "...vocabulary breadth (how many words are known) and vocabulary depth (how well the words are known)". Vocabulary breadth is more closely related to encoding-related skills, decoding, and phonemic awareness. However, vocabulary depth is predictive of future reading comprehension and is therefore related to meaning-related skills (DeVore, 2020). Therefore, a basic language measure such as basic vocabulary knowledge can be considered one of the best predictors of listening comprehension (Alanzo et al., 2016). Considering the important role that vocabulary plays in the development of listening comprehension, it can be said that there is a need for more comprehensive evaluations of the development of vocabulary in early childhood classes and its impact on listening comprehension (Hwang and Cabell, 2021).

Syntactic Knowledge and Skills

In addition to vocabulary knowledge, another determinant in listening comprehension is syntactic knowledge and skills. Syntactic knowledge and skills refer to the ability to understand the internal grammatical structure within a sentence, which includes understanding grammatical rules and how sentences are constructed (Tong and McBride, 2017). Syntactic knowledge and skills, which can also be expressed as implicit knowledge of the rules that determine the structural relationships in sentences, directly affect children's success in listening comprehension. Because meaning can be deciphered by arranging words and phrases. Syntactic knowledge and skills support the development of children's ability to use sentence context and word definition skills by helping them decipher the meanings of words. Syntactic skills also make it easier for children to understand and recognize difficult words they have not learned. Deficiencies in syntactic knowledge will impair the development of word definition skills by limiting their ability to use sentence context (Kim, 2015; Tong and McBride, 2017; Tunmer, 2008). Syntactic knowledge and skills also clearly form the basis for higher levels of understanding. In addition, syntactic knowledge and skills make it easier to monitor comprehension by helping children detect and correct word recognition errors and deduce the meanings of unknown words (Hjetland et al., 2017; Kim, 2015).

Morphological Awareness

Morphological knowledge and morphological awareness are concepts used to characterize knowledge and awareness about the morphological structure of words. Morphological awareness means children's

conscious awareness of the structure of morphemes, the smallest meaning-based elements of words, and their ability to think about and manipulate this structure. Morphemes are the basic building blocks of words in both spoken and written language. Words containing more than one morpheme can be broken down into smaller units, providing clues for meaning, spelling, and pronunciation (Carlisle, 1995; Lyster et al., 2016). Being able to easily manipulate morphological structures can help new readers both break down large and confusing words for better understanding and create new words by adding other morphemes (e.g., suffixes) to a root word (Fracasso et al ., 2016). Children who develop morphological awareness realize that language contains simple and complex words, that these words are composed of subunits, and how these lexical units combine to form new words with meaning. These new uses of morphemes indicate their independent representation in the mental lexicon, which, with experience, is gradually expanded by their use in speech and reading. This morpheme manipulation occurs naturally, without any conscious effort, and develops with exposure to spoken and written language (Vaknin-Nusbaum et al., 2016).

Result of many studies in the literature reveal that (Florit et al., 2009; Florit et al., 2011, Florit 2014; Fong and Ho, 2017; Lepola et al., 2012; Tompkins et al., 2013), foundational language skills such as vocabulary knowledge, morphological awareness and syntactic knowledge are directly related to listening comprehension, furthermore these skills contribute to listening comprehension by supporting higher-order cognitive skills. According to the research results; receptive and expressive vocabulary knowledge consistently predicts individual differences in listening comprehension (Florit et al ., 2009; 2014; Kim, 2015; Lepola et al ., 2012). For example, Florit et al. (2009), in their study, tried to verify the hypothesis that memory makes a special contribution to listening comprehension in preschool children, after controlling the foundational language skills of 44 children aged 4-5. The results concluded that there was a strong relationship between verbal abilities and listening comprehension in 4- and 5-year-old children. In a follow-up study, Florit et al. (2014) found that pre-kindergarten vocabulary and higher-order language measures explained approximately 50% of the variance in listening comprehension later in kindergarten.

Despite these results revealing the relationship between language skills and listening comprehension, some research results in the literature have revealed that the role of foundational language skills, including vocabulary, syntactic knowledge, and skills, in listening comprehension, is unclear and that these skills may be more effective on listening comprehension when evaluated together with basic and high-level skills (Alanzo et al., 2016). For example, in his studies with preschool children, Kim (2015, 2016) found that vocabulary knowledge indirectly predicts listening comprehension through higher-order skills such as comprehension monitoring and theory of mind. Despite the different findings, it makes sense to consider foundational language skills in discussing possible predictors of listening comprehension (Alanzo et al., 2016). However, to support early literacy skills, focusing only on developing foundational language skills in the preschool period is likely to be insufficient to develop early literacy skills. Although listening comprehension begins with building a vocabulary, "good comprehends must go beyond understanding a single word and sentence to build a mental model that integrates multiple propositions of a story (e.g., story elements) and prior knowledge into a coherent whole" (DeVore, 2020; Hogan et al., 2014).

Higher-order Cognitive Skills

The third and final stage skills that contribute to listening comprehension are defined as *higher-order cognitive skills*. Higher-order cognitive skills are skills that integrate words, phrases, and sentences to create a mental model of a text and its meaning, including making inferences, monitoring comprehension, and identifying text structures. These higher-order cognitive skills contribute to the capture of processes "beyond the literal meaning of phrases and sentences" and build on previously possessed basic language and cognitive skills to create mental models of the meaning of a text (Alanzo et al., 2016; Kim, 2015). Within the scope of high-level cognitive skills, children are expected to reach competence in skills such as comprehension monitoring, inference-making, theory of mind, and background knowledge (Fong and Ho, 2017; Hogan et al., 2014; Kim, 2016; Strasser and del Rio, 2014).

Comprehension monitoring

Comprehension monitoring can be expressed as the ability to reflect and evaluate a person's ability to understand the narrated or written text (Kim and Phillips, 2014; Kim, 2015; Oakhill et al., 2005). Comprehension monitoring, which involves deliberately reflecting on one's understanding; is considered a metacognitive skill consisting of individual, strategy, and task variables. Comprehension monitoring, is viewed as a two-component process called evaluation and regulation (Baker, 1985; cited in Kinnunen et al., 1998), which is controlled using various standards or criteria and may not develop at the same pace. Evaluation involves assessing a reader/listener's current state of comprehension. Editing, on the other hand, occurs when the reader/listener evaluates comprehension and finds it inadequate, chooses and implements a strategy such as re-reading the text or making inferences to correct the failure to understand (Yeomans-Maldonado, 2017). Individuals who monitor their comprehension will detect when they do not know the meaning of a keyword, when information in the text does not match their background knowledge, and when two pieces of information are difficult to integrate (Oakhill et al., 2005).

Comprehension monitoring, as the process by which an individual evaluates his or her understanding of information, is primarily seen as a fundamental skill for proficient reading (Wagoner, 1983; cited by Yeomans-Maldonado, 2017). For this reason, the first studies on comprehension monitoring (Baker, 1984; Cain et al., 2001; Cain et al., 2004; Kinnunen et al., 1998; Ruffman, 1996, 1999; Oakhill et al., 2005) examined written texts (comprehension monitoring in reading) and its relationship with reading comprehension. However, recently, there has been an increase in research aiming to reveal how monitoring comprehension in a verbal context is related to listening comprehension. Since in comprehension monitoring tasks the child is asked to identify any inconsistencies or contradictions in the text, this is likely to contribute to listening comprehension. Because children will only notice and identify problems if they evaluate and monitor their understanding (Kim, 2015; Strasser and del Rio, 2014). In the literature, there are research results that show that monitoring comprehension, measured by the ability to identify any inconsistency or contradiction in the spoken text, is directly and indirectly associated with listening comprehension (Kim, 2015, 2016; Kim and Phillips, 2014) and story comprehension (Strasser and del Rio, 2014) skills in preschool children. Research results show that they are related. For example, the study conducted by Strasser and del Rio, (2014) with preschool children revealed that comprehension monitoring partially mediated the relationship between working memory and storybook comprehension. Similarly, Kim (2016) obtained evidence that there is an indirect relationship between comprehension monitoring and listening for six-year-old children. However, in another study conducted by Kim (2015) with preschool students, it was determined that monitoring comprehension directly predicted listening comprehension.

Inference-making

Another higher cognitive skill related to listening comprehension skill is inference-making (Florit et al., 2011; Kendeou et al., 2008; Kim, 2016; Lepola et al., 2012; Strasser and del Rio, 2014; Tompkins et al., 2013). It is expressed in similar forms such as the process of filling in the gaps left open in a story (Hogan et al., 2014), the ability to derive a meaning that is not explicitly stated in the text (Lepola et al., 2012), or the ability of one to fill in the gaps in the text and extract meaning (conclusions) to create a comprehensive mental model of a text and the ability to transcend the literal meaning of words to create a comprehensive mental model (Cain and Oakhill, 2014; Alanzo et al., 2016).

Inference-making is an important component of listening comprehension. Inferences allow the listener to understand information that may not have been directly expressed by using background knowledge and contextual clues to make inferences from the information provided (Hogan et al., 2014). Inferences also include the listener filling in information that is not directly presented in the story, making connections between events in the story, and interpreting events in the story according to one's knowledge of the world (Kendeou et al., 2008; Tompkins et al., 2013). Inferring from tacit knowledge is essential to creating a coherent representation of a story. For example, consider the sentences " Pedro forgot his umbrella" and " Pedro was wet." To connect the two sentences, it is necessary to conclude that it is raining. This inference connects both sentences and gives meaning to the text, making it a coherent whole. Without such inferences, stories become a list of unrelated events (Strasser and del Rio, 2014). In another example, it might be expressed as follows: For example, a child may hear his teacher tell another teacher that there is a banana peel on the floor of his classroom, that one of his students

broke his glass, and that his foot is covered in blood. Although it is not stated explicitly, the young listener can understand that his classmate slipped on a slippery banana peel, broke a glass as he fell, and cut his foot on the broken glass. The child built this mental model by filling in the gaps in the story parts (Hogan et al ., 2014).

Most of the research that aims to reveal the relationship between listening comprehension and inference-making has been conducted with school-age children and adults (Lynch et al., 2008). There is little research examining the inferences that preschoolers make when exposed to a story. Little research has been conducted, probably due to the difficulty of examining inference-making ability in young children who have not yet learned to read and write (DeVore, 2020). However, the number of recent studies aiming to reveal the relationship between preschool children's inference skills and listening comprehension skills (Kendeou et al., 2008; Kim, 2015, 2016; Lepola et al., 2012; Strasser and del Rio, 2014; Tompkins et al., 2013) is seen to be increasing. Research results have revealed that inference-making skills contribute significantly to listening comprehension both directly (Kim, 2016; Kendeou et al ., 2008; Lepola et al., 2012) and indirectly (Florit et al., 2014). For example, Kendeou et al. (2008), in a two-year longitudinal study, aimed to reveal that 4- and 6-year-old children drew inferences from the narratives they remembered about the stories they both listened to verbally and watched on television, including goals, actions, and causal premises, causal consequences, character states and character emotions. aims to reveal. In the study, children's understanding of the story was evaluated by evaluating the combination of three skills. These; are the number of events children remembered from the story, sensitivity to the causal structure of the story, and responses to comprehension questions about the story. As a result of the research, it was concluded that the stories listened to verbally and watched on television and children's inference formation (i.e., the combination of the three skills) were significantly related to their understanding of the narrative at both time points for both 4 and 6 year-old children. In another study using a similar method, Lynch et al. (2008) aimed to examine the relationship between listening comprehension skills and inference-making of 4 and 6 year-old children. Children's recall of verbal and televised stories was assessed by responses to comprehension questions. Research results revealed that children's sensitivity to the causal structure of narratives was significantly related to their overall story recall and the comprehension questions asked following their recall.

Theory of Mind

Theory of mind is another metacognitive skill that is related to listening comprehension. This metacognitive skill involves understanding one's own and others' cognitive states, especially their beliefs and desires (Kim, 2015, 2016; Strasser and del Rio, 2014). Theory of mind allows one to predict and explain the behavior of others based on an understanding of their mental states (Jackson et al., 2022). In this sense, theory of mind refers to the knowledge and understanding of cognitive states and processes and, more broadly, includes social understanding in general (Ebert, 2020). Theory of mind helps listeners understand speakers' intentions, desires, and perspectives, as well as create a mental representation of what the text is about by providing better awareness of social details in the text being listened to. This mental representation may include information about characters, intentionality (or goals), and causality, and thus the theory of mind is an important source of information (Jackson et al., 2022).

One of the main steps in children's theory of mind development is their understanding of false beliefs between the ages of 3 and 5. When children develop the understanding that beliefs can be false (i.e., they can change and differ from reality), they are assumed to have developed a meta-representational understanding of the mind. This understanding can support them to understand multiple perspectives and psychological causality earlier, faster, and more flexibly. As a result, developing a meta-representational understanding of theory of mind can support children's understanding of text through their ability to infer an author's intentions and characters' thoughts and feelings (Kim, 2017). Most research on the theory of mind has been conducted with children ages 3 to 6, looking at the age at which they understand what other people think and want, and whether they understand how those thoughts and desires might be right or wrong. This kind of understanding is important for understanding stories. In the narrative genre, most relationships of coherence are based on the mental states of the characters (Lynch and van den Broek, 2007). Since a critical aspect of understanding narrative texts is not just understanding a series of events but also understanding how the story unfolds as a function of the

characters' goals, beliefs, and emotional responses to the events, thinking about the mental state or thoughts of others, which is a metacognitive ability, is particularly important for listening comprehension in narrative texts (Kim, 2016).

Although the developmental trajectory of the relationship between theory of mind and listening comprehension skills has not yet been determined, there are several studies in the literature showing that theory of mind is an important predictor of listening comprehension skills for children of various ages (Jackson et al., 2022). Especially recent studies (Kim, 2015, 2016, 2017; Kim and Phillips, 2014; Jackson et al., 2022; Strasser and Rio, 2014) provide evidence that theory of mind can be considered a skill related to listening comprehension for children in kindergarten and first grade. For example, in the longitudinal study conducted by Jackson et al. (2022) with 147 children between the ages of 4 and 5, it was aimed to reveal whether theory of mind ability in the preschool period has an effect on later listening skills. In the study, theory of mind, working memory, vocabulary, and grammatical knowledge were tested with both concurrent and longitudinal data. As a result of the research, concurrent findings showed that the theory of mind has a direct effect on listening comprehension. However, longitudinal findings showed that theory of mind in preschool had no direct effect on listening comprehension 22 months later.

Background Information

Another important, but less studied, component of listening comprehension is background knowledge. Creating a rich mental model while listening or reading a text requires integrating new information with our previous knowledge. This adaptation process is defined as a process between a text and our personal and world knowledge, and other texts we hear or read (Hogan et al., 2014; Hwang and Cabell, 2021). It makes sense that to understand a story or text, readers need a threshold of knowledge about the subject. Without such information, it becomes difficult to form a meaningful mental model of what the text is about (Neuman et al., 2014). Without having basic knowledge and context for a particular situation or text, it is difficult to create a mental map to fill in the gaps through inference. Additionally, children demonstrate poor comprehension when they lack background knowledge, even if they know all the words in the text. Children, especially those from disadvantaged backgrounds, lack the basic background knowledge needed to understand academic texts, even if they "know" all the words in academic texts Hogan et al., 2014). Background knowledge associated with the text by the reader or listener interacts with text information to facilitate and enhance comprehension. Input from the text is interpreted in the context of the reader's knowledge, which places constraints on the reader's developing mental representation of the text. In this way, relevant background information facilitates processing of the text and aids subsequent recall. Strong background knowledge can make it easier to make inferences about missing information in a text, a crucial comprehension process (Hogan et al., 2014; Hwang and Cabell, 2021).

Listening Comprehension Skills in Children with Attention Deficit and Hyperactivity Disorder

Although early literacy skills are critical for children's reading and other academic performances, there is limited information regarding the early literacy skills of children with ADHD the literature. The preschool years are a critical time for children with ADHD to develop the language skills and reading interests they need to be successful in school. Identifying the reasons for the problems that children with ADHD experience in early literacy skills during this period can help provide effective support to help children with ADHD achieve age-appropriate success.

Attention deficit hyperactivity disorder is often accompanied by oral language problems, complicating any relationship between attention, hyperactivity, and reading/listening comprehension (Cain and Bignell, 2014). Listening comprehension deficiencies related to both basic and higher-order language skills, especially those that occur with ADHD, prevent children from being successful in academic activities (McInnes et al., 2003). Many studies in the literature have revealed evidence regarding the problems experienced by children with ADHD regarding listening comprehension. In this context, recent studies aimed to examine the high-level linguistic skills of children with ADHD regarding listening comprehension, such as making inferences, integration, and determining cause-effect relationships (Cain and Bignell, 2014; Denton et al., 2020; Flory et al., 2006). Research results show that children with ADHD have difficulty remembering ideas that are central to the meaning of a text

(Miller et al., 2013) and show less sensitivity to cause-effect relationships compared to typically developing children (Lorch, Diener, Sanchez, et al., 1999; Lorch, et al., 2004) revealed that they have difficulties in making inferences and monitoring comprehension from verbally presented narratives and that they also have problems producing verbal retellings by organizing narratives read to them or illustrated in wordless picture books (Denton et al., 2020; Flory et al., 2006; Hayden, 2018; Tannock et al.,1993). However, research results show that in children with ADHD; It has been revealed that they also experience problems with other cognitive skills related to listening comprehension, such as problem-solving, information acquisition, and strategy use, and that the problems continue and even increase over time.

Children with ADHD have difficulty remembering what they listen to; In the first studies examining the listening comprehension skills of children with ADHD (O'Neill and Douglas, 1991; Zentall, 1988), the listening comprehension skills of children were compared with typically developing children. In these studies, the listening comprehension skills of children with ADHD were generally evaluated in terms of understanding and remembering explicit story information. As a result of the research, no significant difference was found between the listening comprehension skills of children with ADHD and typically developing children, but it was determined that children with ADHD remembered fewer details from the stories they listened to. For example, in the first study conducted on this subject by O'Neill and Douglas (1991), researchers used a memory task that involved retelling stories by children. The primary focus of the research concerns the study strategies of children with ADHD. Research results revealed that the number of main ideas produced by children with ADHD was not different from that of typically developing children in the control group, but that typically developing children in the control group used more effective study strategies to help them remember. In the study conducted by Zentall (1988), again using a story-telling task, it was found that children with ADHD produced relevant main ideas and event explanations as much as normally developing children in the control group. However, children with ADHD remembered less story content and produced shorter protocols when asked to create their own stories.

Since these first two studies used standard measurements to evaluate the listening comprehension skills of children with ADHD and typically developing children, they could not reveal other recall dimensions that could be more indicative of listening comprehension skills. Another dimension that could not be evaluated in these studies was the effect of differences in importance between story events on recall. Thus, although these early studies show that children with ADHD can recall the same number of story events as typically developing children in the control group, they do not provide information about whether children differ from control children in how they are influenced by factors such as the types and importance of story events they remember (Flake et al., 2007; Lorch et al., 1999; Lorch et al., 2004). However, in later studies, to evaluate the listening comprehension skills of children with ADHD and typically developing children, they moved away from standard measurements and evaluated in the context of "the thematic importance of story events". Studies conducted in this context (Purvis and Tannock, 1997; Tannock, Purvis, and Schachar, 1993) revealed that, as expected, listening comprehension skills in children with ADHD are weaker than their typically developing peers.

For example, the study conducted by Tannock, Purvis, and Schachar (1993) was one of the first studies to use multiple assessments. In the study, boys with ADHD (30 children) and non-ADHD (30 children) aged between 7 and 11 listened to two-voice folk tales and then retold the stories in their own words. Each story was divided into individual events, and the thematic significance of each event was determined by adult raters. The main measure of understanding was the proportion of events remembered at each of the four levels of thematic importance. The study revealed that although children with ADHD had difficulty verbally retelling a complex story, they understood the main ideas and facts in the story as well as the children in the control group. However, as a result of the research, it was found that boys with ADHD remembered significantly fewer events in the story than boys in the control group, but the level of thematic importance had a similar positive effect on recall for both groups. In a similar study, Purvis and Tannock (1997) found that only boys in the control group tended to remember more than boys with ADHD, and once again, the group did not interact with importance. The results of these studies show that children with ADHD are as sensitive to the thematic importance of story information as typically developing children in the control group, but are slightly less able to recall stories.

Children with ADHD experience decentralization; There are several possible reasons why children with ADHD have poorer listening comprehension skills than typically developing children. The first is that children with ADHD show a lack of centrality when listening due to the fleeting nature of their auditory information. A child who has difficulty sustaining attention may show certain problems in the auditory area. Considering how ADHD can impact comprehension processes, it can similarly strain the pool of cognitive resources available to make connections between text ideas. Even when not accompanied by word decoding problems in children with ADHD, reduced attentional resources may impair making text connections, so that text representations may not reveal as much central information as in children without ADHD. This leads to a centrality deficit (Miller et al., 2013). In other words, children with ADHD have difficulty distinguishing between unimportant events and events that are important for the overall meaning of the story. When trying to understand and remember a story, it is helpful to focus one's attention on encoding the more important story events, because not everything can be remembered and these events form the main points or gist of the story. Additionally, these events may be easier and less time-consuming to code than unimportant events because they have a greater number of connections or ties to other important story events. Thus, the connections between these events that enable the creation of a coherent story representation in memory are already provided by the story, and therefore no additional cognitive resources need to be allocated to this task. Therefore, children with ADHD have difficulty identifying important story events and are less able to direct their attention to encoding and then retrieving this information (Flake et al., 2007).

Children with ADHD have problems with working memory; a second reason for the problems experienced by children with ADHD regarding listening comprehension skills is that they have difficulty decoding information in stories due to their limited working memory capacity (Flake et al., 2007 McInnes et al., 2003; Shaw, 2011). Working memory is an aspect of executive function and is also central to current theories about language comprehension and discourse processing. Working memory, often described as the "mental workspace," refers to the ability to actively retain task-relevant information during information processing or problem-solving and is an important cognitive resource associated with individual differences in comprehension (McInnes et al., 2003). When processing and comprehending information, working memory allows the thinker to simultaneously remove irrelevant information, modify relevant information, and create connections and inferences based on stored information. Since this situation is impaired in children with ADHD, it has been observed that understanding explanatory information creates problems that may affect academic success (Shaw, 2011). It is known that children with ADHD experience deficits in many components of working memory. These deficits are linked to difficulties encoding information from stories because they limit the amount of available cognitive resources that can be allocated to this task. Additionally, deficits in working memory limit the ability to encode a coherent story representation in memory, making it less able to sustain the activation of primes when processing new information. Thus, difficulties may arise because children with ADHD have fewer cognitive resources to devote to encoding information and relating this information to previously encoded information (Flake et al., 2007).

The literature shows that children with ADHD face difficulties distinguishing unimportant events from important events (Miller et al., 2013; Lorch et al., 2006), using story structure or clues to get the necessary information (Flory et al., 2006), understanding and recalling causal relationships between events in the story (Flake et al., 2007; Lorch et al., 1999; Lorch et al., 2004; McInnes et al., 2003), making logical inferences based on stories and that they face more difficulty compared to typically developing children in these subjects (Dong, 2022; Lorch et al., 2006; Niu et al., 2021). All of these areas of difficulty experienced by children with ADHD are interrelated and require higher-order cognitive processing to achieve and maintain a coherent understanding of a story they are listening to (Hayden, 2018).

One of the main problems experienced by children with ADHD due to poor working memory is the difficulties they experience in listening comprehension skills, which require them to make inferences and establish causal connections. Because declarative information relies heavily on working memory and is less predictable, therefore, the child may use limited prior knowledge to aid comprehension (Cain and Bignell, 2014; Shaw, 2011). Explanatory listening comprehension consists of academic tasks that children must complete, such as listening to a lecture in class or learning from a textbook. These tasks

require the ability to grasp facts, make inferences, and determine what information is important and irrelevant. Making inferences and making causal connections is vital to understanding the information presented in the classroom. These skills are frequently impaired in children with ADHD and are related to working memory. For children with ADHD, events in a story that are highly causally linked to other events become a causal chain that directs events from the beginning to the end of the story. Events in this causal chain are often evaluated by adults as very important and are therefore often the most important events in the narrative, and those events with multiple causal connections (i.e., important and often goal-related events) are remembered more than other events in a narrative. However, children with ADHD have more trouble distinguishing unimportant events in the story from important events and identifying and remembering events in the causal chain than typically developing children (Hayden, 2018).

These opinions are supported by research results in the literature (Lorch et al ., 1998; Lorch, Diener, Sanchez, et al., 1999; Lorch, Sanchez, et al., 1999; Lorch et al., 2000; Lorch et al., 2004; McInnes et al., 2003; McInnes et al., 2007). For example, Lorch et al. (1998), based on an examination of normal children's understanding of story information in their study, found that children with ADHD may be poorer than normal children in understanding complex causal relationships in stories.

Lorch, Diener, Sanchez, et al. (1999) compared the listening comprehension skills of children with ADHD and typically developing children in their study. The study examined recall as a function of two-story structure variables (the number of causal connections a story event has with other events and whether an event is included in the causal chain connecting events from the beginning to the end of the story) in the context of audio folk tales (fairy tales). 74 children with ADHD and 62 control group children, aged between 7 and 11, participated in the study. Research results showed that the number of causal connections predicted recall in both children with ADHD and children in the control group. However, as the number of causal connections to a story event increased, the increase in recall was greater in control children than in children with ADHD.

In another study conducted by Lorch, Sanchez et al. (1999), four to six-year-old children with and without ADHD watched a television program (Sesame Street). Half of the children were shown toys during the program, and the other half were not shown toys. Within the scope of the research, it was examined whether children's recall of story events was related to various story structure features (number of causal connections, whether an event is in the causal chain of the story, story-grammar category, and hierarchical structure of the story). Both groups of children participated significantly less in the program when toys were present than when toys were not present, but this effect was larger for children with ADHD. Furthermore, both groups of children showed sensitivity to the causal structure of stories, but when attention was reduced by the presence of distracting stimuli, children with ADHD showed less sensitivity to the causal structure of stories.

In their study, McInnes et al. (2003) examined listening comprehension skills in the context of explanatory information in four groups of children with ADHD, ADHD together with language impairment, only language impairment, and no learning, language, or attention impairment, and compared them in the domains of verbal memory span, verbal working memory, spatial span and spatial working memory. Results showed that children with ADHD understood explanatory information less than children in the comparison group. Although children with ADHD performed the same as the comparison group when asked about factual information, they had difficulty making inferences and self-monitoring to understand instructions. Children with ADHD also performed less well than children in the comparison group on verbal working memory, spatial span, and spatial working memory, and had difficulty finding errors in sequential instructions. These results indicate that even if children with ADHD have sufficiently developed foundational language skills, they have problems with listening comprehension tasks that require higher levels of working memory, comprehension monitoring, and controlled processing.

In another study conducted by McInnes et al. (2007), they investigated the effects of working memory, vocabulary, and grammar on story comprehension in children with ADHD. Research results have shown that children with ADHD remember less information from stories than typically developing children and are less sensitive to the importance of the information they remember. Additionally, children with

ADHD have been found to have problems answering factual questions. Further analysis revealed that deficits in story comprehension could be explained by problems in working memory.

As can be seen from the above research results, it is quite clear that children with ADHD exhibit listening comprehension difficulties compared to their typically developing peers. Many studies show that children with ADHD have difficulty producing explanatory inferences and predictions due to their inability to distinguish between explicit and implicit causal connections (Hayden, 2018).

Conclusion

Effective listening comprehension is an important component of school performance, especially in the early years of school, and requires a range of cognitive skills. First of all, listening comprehension is a strong indicator of cognitive processing and cognitive development. Therefore, by investigating listening comprehension, one can gain insight into aspects of children's cognitive functioning. These include strategic allocation of attention, selecting, coding, and interpreting important information, use of story structure, retrieving relevant historical information, generating inferences that enable interpretation of the information presented, monitoring comprehension, and using retrieval skills. Thus, listening comprehension provides a sort of microcosm for investigating almost all aspects of comprehension in general. Such information is particularly important in better understanding the academic difficulties experienced by children with ADHD (Lorch et al., 2004).

The listening comprehension skills of children with ADHD show great differences compared to typically developing children. For children with ADHD, some listening situations overload their processing abilities, leading to problems such as inattention or on-task behavior. Such potential difficulties with sub-dimensions of listening behavior can prevent accurate understanding and recall of information in many cases; for example, knowing the amount of processing effort required to understand information, knowing what is salient, and making sense of what is said. Additionally, incomplete understanding of verbal information may affect children's ability to respond appropriately to the communication of others and may be an important factor underlying some of the behavioral symptoms of ADHD that are most detrimental to social development and learning (McInnes et al., 2001).

For these reasons, considering the developmental characteristics of children with ADHD, supporting early literacy skills in the preschool period is very important for the development of children's skills in the fields of language and social development. Improving the listening comprehension skills of preschool children with ADHD may help prevent both academic failures and social adaptation behaviors that these children may experience in the future. In addition, accurately assessing the listening comprehension skills of preschool children with ADHD and the relationship between these skills and their inattentive and hyperactive/impulsive behaviors will facilitate the identification of children at risk of future reading difficulties.

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Ethics statement: In this study, we declare that the rules stated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with and that we do not take any of the actions based on "Actions Against Scientific Research and Publication Ethics". At the same time, we declare that there is no conflict of interest between the authors, which all authors contribute to the study, and that all the responsibility belongs to the article authors in case of all ethical violations.

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