KHAZAR UNIVERSITY

School: Graduate School of Science, Arts and Technology

Department: Psychology

Qualification: Clinical Psychology

MASTER'S THESIS

THE RELATIONSHIP OF THE DEVELOPMENT OF SPEECH AND MOTOR SKILLS OF CHILDREN WITH AUTISM IN THE PERIOD OF EARLY DEVELOPMENT

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Baku – 2025

XƏZƏR UNİVERSİTETİ

Fakültə: Təbiət elmləri, Sənət və Texnologiya Yüksək təhsil
Departament: Psixologiya
İxtisas: Klinik psixologiya

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MAGİSTR DİSSERTASİYA İŞİ

AUTİZMLİ UŞAQLARIN ERKƏN İNKİŞAF DÖVRÜNDƏ NİTQ VƏ MOTOR BACARIQLARININ İNKİŞAFININ ƏLAQƏSİ

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Bakı – 2025

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INTRODUCTION

Relevance of the topic. Speech for communicating is an essential component of an individual's everyday routines. Such abilities develop in the initial stages of childhood. The need and skill for interpersonal interaction via others is the initial phase of developing social skills in the early years, which followed developing the skill of vocal speech. Social communication, as well as the development of language and speech skills, are tightly associated. The fact is that social communication processes throughout the first year of life promote the formation of language and speech abilities. Early childhood development contains the establishment of speech, language, cognition, motor, social, and emotional skills from fertilization to school age. All such skills empower us to analyze information, figure out solutions, express emotions, communicate, and form bonds. Early childhood development consists of three stages: The period from fertilization to birth, the period from birth to three years old, and the preschool period. Social communication involves both nonverbal and verbal ways of communication. Understanding and using gestures, facial expressions, and emotions while sustaining eye contact are nonverbal communication methods which provide the infant and caretaker with their first social interaction. An infant without speech abilities attempts to recognize the caretaker's facial expressions throughout the period and behaves in accordance. An infant without verbal communication skills, such as speech, actively depicts his wants as feelings through gestures, establishing social communication. The development of the infant's motor skills, both fine and gross, is critical in promoting social communication. He uses shared attention to communicate his wishes and initiate social connection by moving his hands in the desired direction, opening and closing them, and gazing at his caretaker. Due to his enhanced fine motor skills, he can now express his wishes and maintain social communication by pointing his index finger in the desired direction. With an increasing age, he gains verbal communication skills. During the first three years, he can convey his wishes using both nonverbal and verbal communication techniques. However, throughout the first three years of development, a child with autism spectrum disorder exhibits deficiencies in a variety of areas, particularly difficulties in social contact with peers, limited interests, and repetitive behaviors.

One of the basic symptoms for identifying ASD in the American Psychiatric Association's (APA) Diagnostic Statistical Manual, 5th Edition (DSM 5) is "Difficulties in Social Communication and Interpersonal Communication." The ICD 11 classifies ASD into five main categories: a) ASD it disorder of intellectual development and with impaired functional language, b) ASD with disorder of intellectual development and with absence of

functional language, c) ASD without disorder of intellectual development and with mild or no impairment of functional language, d) ASD with disorder of intellectual development and with mild or no impairment of functional language and e) ASD without disorder of intellectual development and with impaired functional language. Language and speech impairments in ASD children can be caused by a variety of factors. Comorbidity problems in ASD children with other developmental disorders such as Developmental Language Disorder (DLD), Apraxia of Speech (AS), or low Intelligence Quotient (IQ) level14 also influence language and speech abilities in ASD because development is often considered as a continuum. Children with ASP are separated into two groups to better understand their language development. Normal Language Development (ASD-LN) and Language Impairment (ASD-LI). Children with ASD and a LI profile appear to have difficulty developing language skills. A subclassification of children with autism who have typical language development is used, separating them into children with Low Language Abilities (ASD-LL) and children with High Language Abilities (ASD-HL) (Peristeri E, Andreou M, Tsimpli I, Syntactic M, 2017).

According to WHO data from 2023, almost one out of every one hundred children have ASPD. Children with ASPD struggle with social communication because they deficiency both nonverbal and vocal communication skills, as well as a lack of interest in social contact. Thus, children with this diagnosis exhibit impaired eye contact, gesture interpretation, use of language, and delays in speech. Impaired speech development can be seen in a lack of expression of one's due demands in brief speech, inappropriately employing personal pronouns, the literal understanding of metaphors, and age-inappropriate vocabulary and expressive speech. Motor abilities are another area in which children with ASPD exhibit deficits. Autistic disorders, like those that cause delays in speech development, exhibit delays and atypical patterns of development in motor abilities. ASDs are reported to have less developed motor abilities than their peers. "Imitating movement patterns also influences the development of communication and socialization, and this is associated with the development of language skills later in life" (Bates, 2014, p. 2367).

Although speech and motor skills appear to be independent domains at first appearance, recent research indicates that they are inextricably linked. For example, children with motor planning disorder (dyspraxia) have trouble coordinating their speaking muscles, which can impair their ability to talk. New study in this area may lead to more effective approaches to develop speech and movement abilities simultaneously. According to WHO, early diagnosis and intervention may enhance the development of social communication and speech skills in people with autism. Although research on this topic is currently lacking, more

in-depth and complicated assessments have started to be conducted in recent years as multidisciplinary techniques have increased. In Western countries, the neural basis of speech and motor skills is being studied using functional MRI and other neuropsychological methods. In Azerbaijan, on the other hand, research in this area relies mainly on clinical observations and testing to determine the level of development. However, there is a need to expand the variety and quality of methodological approaches. In general, research studying the relationship between speech and motor skill development in autistic children can help with their rehabilitation, early intervention programs, and social integration. As a result, the topic has significant scientific and practical value and is one of the most important sources for future research. Autism spectrum disorder (ASD) is a neurodevelopmental disease that affects social communication, behavior, and interests. Based on this growing trend, several studies in psychology and neuroscience have been done to investigate the developmental dynamics of children with ASD. Researchers emphasize that the development of speech abilities is not confined to the process of language learning, but also considers the child's motor coordination, perception, and sensory integration skills. Speech development in children with autism spectrum disorder (ASD) is especially unusual or delayed. According to recent research, children with ASD face considerable challenges not just in social and emotional development, but also in motor skills and speech development. Research suggests that motor skills and speech development are tightly linked in the brain. Motor skill development (including fine and gross motor functions) begins at an early age and has a significant impact on a child's entire development, particularly speech development. According to Iverson (2021), delays in motor milestones such as sitting, walking, and crawling can lead to future speech and communication difficulties. This concept also applies to children with ASD, and it is deemed scientifically relevant to examine this relationship further. Thus, deficiencies in speech and motor abilities in children with ASD are associated with deficits in socializing skills, particularly in early infancy. "Research findings suggest that interventions for motor skills can improve not only motor skills, but also social and communication skills in children with ASD." (Sundarajoo and Peters, 2022). "These abnormal speech patterns can hinder communication and social interaction, making it difficult for individuals with autism to express themselves or understand others effectively" (Special Learning, 1999). According to Bedford, Pickles, and Lord (2016), gross motor skill deficits identified in early childhood are a significant predictor of speech development markers in children. This research demonstrates a clear relationship between speech and motor development, emphasizing the significance of early intervention. Furthermore, Fulceri et al. (2018) found that motor skills may influence the basic symptoms of ASD, and that working on these skills can enhance functional development

in children. This approach emphasizes the value of research that focuses on both useful interventions and parent education. Another study reveals that motor skill deficiencies and sensory abnormalities can impede speech muscle coordination in children. Speech muscle coordination issues, such as verbal dyspraxia, are common in children with autism. Children with verbal dyspraxia struggle to pronounce words because their mouth and tongue muscles do not operate properly. In these circumstances, the youngster may have a vocabulary, but it is difficult to pronounce and apply the words appropriately (Tierney et al., 2015). As a result, motor planning impairments are one of the most crucial factors influencing speech quality. According to Belmonte and Bourgeron (2022), this link has a neurological basis, with abnormal motor and sensory processes having a direct impact on speech organization and expression. Although the number of studies on this topic is currently limited, more in-depth, and complicated analyses have begun to be done in recent years as multidisciplinary techniques have increased. In Western countries, the neural basis of speech and motor skills is studied using functional MRI and other neuropsychological methods. In Azerbaijan, however, research in this field is mainly based on clinical observations and measuring the level of development with tests. However, there is a need to increase the number and quality of methodological approaches.

The object of the research. Children aged 0–6 years diagnosed with autism spectrum disorder during early developmental stages.

The subject of the research. The investigation of the relationship between the development of speech and motor skills in children with ASD and its influence on their developmental trajectories.

The purpose of the research. To examine the relationship between speech and motor skill development in children with Autism Spectrum Disorder and evaluate its impact on the overall developmental process.

Hypothesis of the research. There are three (one main and two auxiliary) hypotheses in the research study:

H_0: There is no statistically significant relationship between motor skills (fine and gross) and speech skills in children with autism spectrum disorder.

H_1: There is a statistically significant relationship between fine motor skills and speech skills in children with ASD.

H_2: There is a statistically significant relationship between gross motor skills and speech skills in children with ASD.

Task of the research. The task of the research is specified as follows:

- To describe specific characteristics of speech and motor development in children with ASD.
- To assess the degree of correlation between these two domains using quantitative methods.
- To identify motor-related factors that may influence language development.
- To propose targeted intervention strategies based on the findings.

Methods of the research. The following methods were used in this research:

- Psychoeducational Profile-Revised (PEP-R) for motor skills (Appendix-1).
- Portage Guide to Early Education for speech abilities (Appendix-2).

The assessment of fine and gross motor skills was conducted using the Psychoeducational Profile – Revised (PEP-R). The fine motor skills domain consisted of 16 items, while the gross motor skills section comprised 18 items, allowing for a structured and standardized evaluation of motor development in children with Autism Spectrum Disorder (ASD). For the assessment of speech and language development, the Portage Guide to Early Education was employed. This tool includes 123 items specifically designed to evaluate a wide spectrum of verbal abilities, ranging from basic pre-linguistic behaviors to complex expressive and receptive language skills.

Scientific novelty of the research. This research offers a new perspective by focusing specifically on the link between speech and motor skills in young children diagnosed with ASD—an area that remains under-researched in the Azerbaijani context. The findings contribute to the scientific understanding of ASD and underscore the importance of integrating motor development into early speech intervention programs.

Practical significance of the research. This research identifies the relationship between motor and speech skill development, it provides practical guidelines for specialists such as speech therapists, special education teachers, psychologists, and parents. The findings can be utilized to design more effective intervention programs that simultaneously target both motor and speech skills, ultimately contributing to the enhancement of communication abilities and social integration of children with ASD.

Structure of the research work: The dissertation consists of an introduction, three chapters, result, references and a list of appendices.

CHAPTER I. LITERATURE REVIEW

1.1. Theoretical foundations of Autism Spectrum Disorder

Autism is classified as a "spectrum" condition due to the broad variability in symptom presentation and intensity among individuals. The DSM-5 adopts a multidimensional perspective in diagnosing autism, recognizing that certain traits may manifest at different levels of severity. While the dimensional model allows for gradations in behavioral expression, autism remains a categorical diagnosis—an individual either meets the diagnostic threshold or does not. Thus, while the concept of a spectrum suggests a range between distinct types, the dimensional view accommodates diverse intensities of traits without implying a singular continuum. Autism primarily affects how individuals perceive social situations and engage in interpersonal interactions (Durand, 2014).

According to the DSM-5, Autism Spectrum Disorder (ASD) is defined by two principal diagnostic domains: (1) impairments in social communication and interaction, and (2) patterns of restricted and repetitive behaviors, activities, or interests (American Psychiatric Association, 2013). These manifestations must arise during early developmental stages and significantly interfere with day-to-day functioning. The current classification merges previously distinct diagnoses, including autistic disorder, Asperger's syndrome, and pervasive developmental disorder—not otherwise specified—into a unified spectrum based on symptom severity. To capture this variability, the DSM-5 outlines a three-level severity scale: Level 1 ("requiring support"), Level 2 ("requiring substantial support"), and Level 3 ("requiring very substantial support"). These levels are applied separately to social communication difficulties and repetitive behavioral patterns.

Early identification is a critical prerequisite for the timely implementation of intervention strategies in individuals diagnosed with Autism Spectrum Disorder (ASD). Although a formal diagnosis of ASD is typically established after the age of three, certain early developmental indicators may alert caregivers and professionals to the possibility of an increased risk at a much younger age. These early warning signs include a lack of social smiling by six months of age, an absence of communicative gestures such as pointing or waving "bye-bye" by 12 months, and failure to produce single words by 16 months. Furthermore, the inability to form simple two-word phrases by 24 months and noticeable developmental regression—such as the loss of previously acquired speech—are also considered significant red flags (Tekin-İftar et al., 2018).

The manifestation of Autism Spectrum Disorder (ASD) symptoms can differ according to the child's stage of development. Although these indicators typically emerge during the early

months of life, they may not always be immediately apparent. Empirical findings suggest that during the initial six months, it is particularly challenging to detect such signs, as the behavior of the infant closely resembles that of typically developing peers. However, after the six-month mark, notable reductions in eye contact and diminished social smiling often become evident (Kaya, 2022).

Some theorists continue to portray autism as a lifelong, incurable condition. However, both individuals on the spectrum and their families have questioned the assumption that autism is intrinsically linked to suffering. Many acknowledge autism as a persistent neurodevelopmental profile but dispute the notion that it automatically reduces life quality or results in chronic hardship. These contrasting perspectives—viewing autism either as a medical disorder or as a naturally occurring variation in neurodevelopment—coexist within contemporary discussions. Historically, psychiatric classifications for children once conflated early-onset developmental disorders with adult psychotic conditions. Following Kraepelin's identification of dementia praecox in adolescents, labels like childhood schizophrenia or psychosis were applied to children, excluding those with cognitive delays. Over time, developmental distinctions emerged, notably with Leo Kanner's seminal identification of early infantile autism. In his observations of eleven children, Kanner described an "innate disturbance of affective contact," highlighting two hallmark features: a profound disinterest in social interaction and an extreme insistence on routine and predictability, often accompanied by stereotypical motor behaviors. These traits, typically observable within the first two years of life, remain central to the contemporary definition of classic autism, which also includes communicative features like mutism and echolalia (Kanner, 1943).

Shortly thereafter, Hans Asperger introduced clinical descriptions of boys who exhibited social challenges, narrowly focused interests, and relatively strong verbal capacities (Asperger, 1944/1991). Kanner's influential work established autism as a distinct clinical entity, separating it from childhood psychosis and embedding it within both scientific literature and public understanding. While the term "autism" had earlier been used to denote extreme social withdrawal, Kanner clarified its meaning in developmental psychiatry. His terminology, however, did not specify whether the condition extended into adulthood (Kanner, 1943)

Leo Kanner is often credited as a foundational figure in American child psychiatry, while Hans Asperger's contributions remained lesser known until British psychiatrist Lorna Wing translated and interpreted his work in the 1970s. Although later investigations revealed Asperger's troubling affiliations with the Nazi regime, his clinical observations remain integral to the historical evolution of autism as a diagnostic concept (Wing, 1981).

Both Kanner and Asperger made significant contributions to early understandings of autism. In his Habilitation thesis Die “Autistischen Psychopathen” im Kindesalter, Asperger chronicled children who, like Kanner’s patients, appeared socially isolated and self-focused. He described these individuals as existing predominantly within their own mental worlds—disconnected from societal norms and reciprocal relationships. Although the term psychopathen may now seem misleading, Asperger used it to convey what he considered an “autistic personality disorder”—a fixed and innate aspect of the individual. In contrast, Lorna Wing’s reinterpretation in 1981 introduced the term Asperger syndrome and emphasized it as a developmental rather than personality disorder. Wing's interpretation generated debate over whether Asperger syndrome should be classified as a distinct diagnosis or as part of the broader autism spectrum. A distinguishing feature noted in Asperger syndrome is the absence of early language delay. Wing also advocated for the spectrum model of autism based on a trial of impairment social interaction, communication, and imaginative function (Wing, 1981).

Since these pioneering studies, research has increasingly linked the core features of autism to deficits in social cognition. One widely accepted theoretical model is the Theory of Mind (ToM) hypothesis, first articulated by Premack and Woodruff in 1978. ToM refers to the capacity to comprehend and infer others’ mental states—such as beliefs, intentions, and feelings—which is often compromised in individuals with autism (Premack and Woodruff, 1978).

The documented increase in autism diagnoses over the last few decades has led to various explanations. Some attribute the rise to broader diagnostic criteria and increased awareness. Others argue that autism is sometimes used as an alternative diagnosis to intellectual disability, due in part to social stigma or differences in available services. Additional theories cite environmental influences or propose that modern society, with its heightened social demands, exacerbates challenges for individuals with autistic traits. Autism Spectrum Disorder (ASD) is a multifactorial condition with no single identifiable cause (Durand, 2014). Historically, erroneous theories placed the blame on parental behavior. Figures such as Bettelheim (1967) and Tinbergen & Tinbergen (1972) supported the idea that autism resulted from cold or emotionally distant parenting. Kanner (1949) also described the parents of children with autism as perfectionistic and detached, often noting their high socioeconomic status and above-average intelligence (Kanner, 1943; Allen et al., 1971; Cox et al., 1975). These parent-blaming theories were both stigmatizing and psychologically damaging, contributing to long-standing feelings of guilt and shame among families.

In the clinical evaluation of ASD, it is essential to adopt a framework that incorporates both a spectrum-based perspective and an assessment of the severity of core symptoms. The

tri-level classification system presented in the DSM-5 (Level 1: requiring support; Level 2: requiring substantial support; Level 3: requiring very substantial support) facilitates the identification of individualized developmental needs and informs the selection of contextually appropriate therapeutic interventions (American Psychiatric Association, 2013). This stratified model underscores the necessity of tailoring diagnostic and rehabilitative planning to accommodate the heterogeneity observed in autistic symptomatology. Contemporary scholarly and historical analyses have demonstrated that certain antiquated conceptualizations of autism—particularly theories attributing the condition to parental emotional detachment, most notably among mothers—lack empirical foundation and have perpetuated damaging psychological outcomes and societal stigmatization for affected families. It is critical that such misconceptions (Bettelheim, 1967; Kanner, 1949) be rigorously challenged within the current scientific paradigm and systematically deconstructed in the public domain. Consequently, there is a pressing need to equip caregivers and professionals with up-to-date, evidence-based knowledge and to broaden public education initiatives accordingly. Rather than viewing autism exclusively through a biomedical lens, it is increasingly acknowledged as a distinct neurodevelopmental variation. This reconceptualization offers a constructive alternative to deficit-based models that portray autism as inherently diminishing quality of life or constituting a lifelong impediment. Modern academic and societal discourse increasingly embraces autism as a manifestation of neurodiversity, emphasizing the value of cognitive variation and advocating for greater societal acceptance of neurological differences. Such an inclusive stance not only promotes social integration but also fosters environments in which individuals on the spectrum can more fully actualize their personal and interpersonal potential.

1.2. The impact of Autism Spectrum Disorder on early childhood development

Early childhood development refers to the learning of abilities and skills in speech, language, cognitive, motor, social and emotional development from fertilization to school age. All of these abilities enable us to think, solve problems, communicate, express emotions, and build relationships. Early childhood development is divided into three stages: the period from fertilization to birth, the period from birth to three years old and the preschool period (from three years old to five or six years old, or school entry age) (UNICEF, 2021).

Individuals diagnosed with Autism Spectrum Disorder (ASD) frequently encounter persistent difficulties in verbal and non-verbal communication, social engagement, and imaginative functioning. While even neurotypical individuals may occasionally experience discomfort in social scenarios—such as hesitation in unfamiliar environments, nervousness

during interactions with strangers, or apprehension when speaking in front of an audience, they are generally capable of navigating familiar social contexts with relative ease. In contrast, individuals with ASD tend to exhibit social discomfort or anxiety across a broad range of contexts, regardless of familiarity, suggesting a pervasive impairment in social reciprocity rather than a situational response (American Psychiatric Association, 2013). Their challenges are often consistent and enduring, impacting their ability to initiate and sustain social exchanges, interpret non-verbal cues, and respond appropriately to others. According to Motavalli-Mukaddes (2017), when individuals with ASD demonstrate the capacity for maintaining eye contact, collaborating within structured educational settings, and sustaining attention for prolonged periods without exhibiting disruptive behavior, these abilities may be generalized to broader social environments. However, such transfer of skills typically requires purposeful generalization techniques and structured intervention to be effective.Repetitive behaviors are frequently cited by parents as one of the most distressing and challenging aspects of raising a child with Autism Spectrum Disorder (ASD). When not effectively managed, a child's strong attachment to routine and resistance to change can begin to dominate family life, creating stress and limiting flexibility in daily functioning. These behaviors often serve as coping mechanisms through which the child attempts to establish a sense of predictability and control in an environment they may perceive as disordered or overwhelming. Therefore, it is essential that interventions account for the function of such behaviors and aim to introduce consistent structure and routine into the child's daily life. While repetitive behaviors are a core characteristic of ASD and, to some extent, should be acknowledged and accepted, they may require intervention when they significantly interfere with family routines or hinder the child's engagement in more constructive or developmental activities. In such cases, it becomes necessary to clearly define limits around these behaviors in order to support both the child's growth and the well-being of the family (Wing, 1996).

A subset of adolescents and young adults diagnosed with Autism Spectrum Disorder (ASD) may develop a noticeable deceleration in their physical movements as they mature. During the execution of a task, they may abruptly pause midway through the action, remaining immobile for several seconds. In certain cases, these episodes can extend for several minutes or even longer. Individuals may encounter challenges transitioning between physical spaces—such as moving from one room to another or crossing surfaces with differing textures—and may demonstrate repetitive behaviors like taking short steps forward and backward. Furthermore, some may be unable to initiate movement independently unless they observe another person performing the action first, such as rising from a seated position. This impairment can significantly interfere with daily functioning and self-care activities.

This condition is clinically referred to as catatonia. Individuals affected by catatonia often exhibit a profound lack of voluntary movement or initiative. If the condition persists over time, the person's motor abilities may deteriorate further, resulting in a deep catatonic state. Although the prevalence of catatonia among individuals with ASD is relatively low, its underlying etiology remains uncertain (Wing, 1996).

Children with typical development usually display a preference for close physical contact during early infancy. For instance, when embraced at around 3–4 months of age, they often respond positively by relaxing into the hug. In contrast, infants later diagnosed with Autism Spectrum Disorder (ASD) may exhibit resistance to such contact, remaining tense or attempting to withdraw quickly from the embrace (Topçu, 2017). Attachment difficulties become more pronounced as development progresses. While neurotypical children begin to exhibit separation anxiety and stranger anxiety around 8–9 months of age, children with ASD may show limited attachment responses. These children might not express distress when left alone with unfamiliar individuals, indicating potential deficits in forming secure attachments (Topçu, 2017).

Although individuals diagnosed with Autism Spectrum Disorder (ASD) often experience developmental delays in various domains compared to their typically developing peers, some exhibit exceptionally advanced abilities in specific areas. These savant-like skills may include playing musical instruments or composing original music, performing complex mathematical operations such as extracting square roots of large numbers, identifying the day of the week for any given date across many years, reading rapidly despite limited comprehension, memorizing extensive factual information about preferred subjects, constructing intricate mechanical or electrical devices, and utilizing computers proficiently. Such talents are frequently associated with strong visual-spatial processing or rote memory.

Individuals diagnosed with Autism Spectrum Disorder (ASD) also exhibit distinctive patterns in sensory processing compared to their neurotypical peers. They may display either heightened sensitivity to sensory input or, conversely, an apparent indifference to sensory stimuli. Moreover, children with ASD often engage with their sensory experiences in unconventional ways. For instance, they might utilize their sense of smell or touch to explore or identify an object. It is common for them to manipulate unfamiliar items between their fingers, then bring them close to their nose or mouth to sniff or lick them. This atypical sensory behavior tends to emerge most frequently between the ages of 2 and 5, although the onset and manifestation can vary among individuals. During this same developmental window, sleep disturbances are also commonly reported. Many children in this group are described as crying persistently both during the day and at night, with caregivers often

struggling to soothe them. Research indicates that these sensory-related sleep challenges are approximately twice as prevalent in children with ASD than in typically developing children. Nevertheless, for some individuals, these issues diminish or resolve with the onset of adolescence (Darıca, Abidoğlu, & Gümüşcü, 2017).

For instance, individuals with exceptional drawing skills often possess the capacity to recall and reproduce visual stimuli with high precision. They may mentally manipulate an image and recreate it from alternate perspectives. It is particularly noteworthy that some artistically gifted individuals with ASD are capable of illustrating from multiple viewpoints with remarkable accuracy, something that typically developing children only achieve after acquiring an understanding of visual perspective through several developmental stages. These children may show a preference for working in a single medium, producing repetitive content such as drawings of the same object, repeated musical performances, frequent use of calendar-based calculations, and so forth. In some cases, these exceptional skills appear to diminish or cease entirely, either during childhood or later in adulthood. The causes underlying this phenomenon remain unclear, and it is uncertain whether these abilities are permanently lost or simply no longer accessed. Despite comprehensive support efforts, these talents are seldom reactivated (Wing, 1996).

Such behavioral differences often persist into later stages of development. For example, children with ASD may prefer solitary play, acting as though unaware of others in their environment. They frequently avoid direct eye contact and may appear to fixate on distant objects when someone tries to engage with them visually. Repetitive behaviors, such as extended periods of playing with the same toy, are also common and may give the impression of the child being calm or withdrawn into a personal world. However, interruptions to their preferred activities may provoke intense emotional reactions, including throwing objects, lying on the floor and crying, or engaging in self-injurious or aggressive behaviors. A prevalent issue encountered in individuals with Autism Spectrum Disorder (ASD) is the presence of sleep disturbances. Empirical studies indicate that approximately 40–80% of children diagnosed with ASD experience difficulties related to sleep (Kaya, 2022). These disturbances tend to intensify behavioral challenges, increase the overall severity of autistic traits, and contribute to the emergence of additional symptoms. Common manifestations of sleep-related issues include irregular sleep schedules, frequent nocturnal awakenings, and significant difficulties in initiating sleep. It is essential to closely monitor and address these issues through appropriate intervention strategies. If left untreated, sleep disturbances may contribute to learning difficulties over time, hinder the effectiveness of educational interventions, and negatively impact developmental progress. Moreover, such

ongoing problems may result in a decline in the child's overall functioning and impose considerable physical and emotional strain on the caregiver (Kaya, 2022).

It is important to note that many of these behaviors are not exclusive to ASD. Typically developing children may also exhibit repetitive or emotionally intense behaviors—such as arm flapping, jumping, or strong emotional outbursts—especially during early developmental phases. These behaviors are particularly prevalent between the ages of two and three. The key distinction lies in the trajectory of these behaviors: in typically developing children, such behaviors are transient and tend to diminish as social and emotional capacities mature. In contrast, among children with ASD, these traits often persist over time and may continue into adolescence or adulthood (Wing, 1996).

Sleep-related challenges are frequently observed in individuals on the autism spectrum, typically presenting as difficulties initiating sleep, maintaining sleep continuity, or experiencing premature awakenings. Contributing elements may include elevated levels of anxiety, heightened sensory reactivity, irregular daily schedules, or insufficiently organized daytime engagements, all of which can disrupt typical sleep cycles. Establishing a consistent and soothing nighttime routine can markedly enhance sleep efficiency. This approach may incorporate the use of visual timetables, reducing stimulating tasks while encouraging calming activities for at least an hour prior to bedtime, and optimizing the sleep setting to ensure maximum comfort. Additionally, it can be advantageous to educate the child about the value of restorative sleep. Empirical evidence indicates that the blue light emitted by digital screens—such as smartphones, tablets, and computers—can impede the onset of sleep. Therefore, restricting screen exposure to at least two hours before sleeping may prove beneficial. Furthermore, participating in calming practices, such as progressive muscle relaxation exercises before bedtime, may contribute to improved sleep outcomes (Maria E Verhoeff et all., 2018).

Although children with Autism Spectrum Disorder (ASD) typically exhibit no anomalies in their physical appearance or general physical development, delays are often observed in their motor development compared to typically developing peers. These children tend to achieve fundamental motor milestones—such as sitting, crawling, and running—later than neurotypical children. In typical development, infants explore their environment actively by mouthing objects, banging them on surfaces, and attempting to dismantle them. Prior to the onset of verbal communication, they engage in preparatory behaviors such as crying, babbling, and laughing, gradually building the foundation for speech. By the twelfth month, many skills are acquired through observational learning and imitation, which support the development of both gross and fine motor abilities.

However, children with ASD often demonstrate minimal interest in their external environment, which hinders the optimal development of both large and especially small muscle groups. As a result, their motor coordination and manual dexterity are frequently underdeveloped. Fine motor skills—including tasks such as writing, staying within the lines while coloring, cutting with scissors, or threading beads—are commonly impaired or do not reach age-appropriate proficiency. In contrast, some children with ASD display motor behaviors in gross motor domain such as walking, running, or kicking a ball—that resemble those of typically developing children. Nonetheless, the execution of these skills may vary significantly; some children may run either unusually fast or very slowly, while others may walk with a slight lateral lean or a forward tilt. A subset of children demonstrates persistent toe-walking, a gait pattern that may continue from early childhood into later years, although such occurrences are rare. Moreover, crossing arms during locomotor activities such as walking or running may be delayed or absent. Motor skill development in children with ASD is often inconsistent. For instance, a child may exhibit proficient running and walking abilities but struggle with climbing stairs or jumping. Another child may demonstrate fine handwriting yet be unable to thread large beads or may possess adequate manual skills but present with poor balance or gait coordination. Repetitive and stereotyped behaviors often contribute to these discrepancies, leading to the disproportionate development of certain muscle groups—some becoming unusually strong while others remain comparatively weak. Children diagnosed with Autism Spectrum Disorder (ASD) often encounter societal stigma, social exclusion, and, in some instances, infringements upon their fundamental human rights. Their atypical behaviors—such as challenges in social reciprocity, difficulty transitioning between tasks, an intense preoccupation with specific details, and unusual responses to sensory stimuli—hinder their integration into typical social environments. Scholars and practitioners highlight the critical importance of early intervention in addressing the unique developmental needs of children with ASD. A compelling rationale for this approach lies in the fact that during preschool and early primary years, children demonstrate heightened neuroplasticity and receptiveness to acquiring new skills, thereby enhancing the long-term efficacy of educational and therapeutic interventions. Early intervention also facilitates more effective communication between the child and caregivers, fostering reciprocal understanding. Establishing clearer and more accessible communication pathways helps to reduce behavioral issues, as the child experiences greater emotional security and comfort. This, in turn, strengthens the emotional bond between parent and child (Alkaş, 2022). Moreover, improved communication skills enhance the child's ability to engage in social contexts, thereby increasing the likelihood of familial social participation and integration.

1.3. Developmental characteristics of motor skills

Motor abilities evolve progressively during early childhood, reflecting both biological maturation and environmental influences. These capabilities can be broadly categorized into gross motor skills, which involve large muscle groups responsible for actions such as crawling, walking, jumping, and running, and fine motor skills, which depend on the coordination of smaller muscles, particularly those in the hands and fingers, enabling tasks like grasping, drawing, or manipulating small objects.In typical development, motor competencies follow a predictable sequence, beginning with reflexive movements in infancy and advancing toward voluntary, goal-directed actions. Fine motor skills refer to actions that necessitate the delicate and coordinated engagement of small muscle groups, particularly those in the hands and fingers. These capabilities are fundamental for performing various everyday tasks, such as writing, drawing, eating, and fastening clothing. They play a pivotal role not only in academic performance and social integration, but also in fostering autonomy in daily routines. The development of fine motor skills is shaped by a combination of inborn physiological factors and external environmental influences. These abilities begin forming in early childhood and gradually evolve into more complex and refined motor functions. Fine motor development can be observed across a broad age range—from infancy through adolescence—where early rudimentary hand movements gradually transform into precise, purposeful actions. These motor competencies are essential for children's success in educational and interpersonal contexts. As children enhance their fine motor skills, they also improve their hand-eye coordination, interact more effectively with their environment, and attain greater functional independence. Importantly, this developmental process extends beyond physical ability; it significantly contributes to the child’s cognitive growth and social-emotional maturation. Gross motor development advances rapidly during early childhood, particularly between birth and six years of age. In the initial stages, infants acquire the ability to lift and control their heads, subsequently progressing to sitting, crawling, standing, and eventually walking. This developmental sequence reflects the interaction between the nervous system, musculoskeletal maturation, and environmental stimulation (Adolph & Franchak, 2017). Motor development follows a predictable progression, wherein foundational skills—such as head stabilization—precede more complex milestones like independent locomotion.

The emergence of gross motor abilities is shaped by a combination of genetic predispositions and external influences. Active participation in movement-oriented activities, outdoor play, and developmentally appropriate motor exercises significantly contributes to the acquisition and refinement of these skills (Piek et al., 2008). Moreover, the evolution of gross

motor functions is closely intertwined with cognitive, social, and linguistic development. For instance, as children physically engage with and navigate their environment, they simultaneously foster both motor competence and intellectual growth (Campos et al., 2000). Motor difficulties in children with Autism Spectrum Disorder (ASD) are often associated with abnormal muscle tone, manifesting as either hypotonia (reduced muscle tone) or hypertonia (increased muscle tone), and are frequently accompanied by challenges in motor planning. Dysfunction in the proprioceptive and vestibular systems can further exacerbate these issues, resulting in inaccurate motor execution and disorganized behavior patterns (Whyatt & Craig, 2012).

Common motor impairments in children with ASD typically include:

- Delays in achieving gross motor milestones (e.g., late onset of walking or underdeveloped jumping skills).
- Difficulties with balance and coordination, affecting both static and dynamic postural control.
- Challenges with motor sequencing and planning, such as trouble transitioning smoothly between movements or executing multi-step motor tasks.

Such impairments often hinder children's participation in play and physical activities, which are vital for fostering motor proficiency. Consequently, limitations in motor function may further impact social engagement and emotional regulation (MacDonald et al., 2013). However, targeted intervention strategies, including physical therapy, occupational therapy, and structured motor skill training programs—have demonstrated efficacy in enhancing gross motor capabilities in children diagnosed with ASD (Staples & Reid, 2010).

The developmental trajectory of these skills is sequential and hierarchical—earlier skills serve as a foundation for more advanced abilities. For example, trunk stability and postural control precede the emergence of fine motor precision. Motor development is also shaped by the interaction between genetic predispositions and experiential factors. Opportunities for active engagement in movement, access to stimulating environments, and caregiver support all contribute to the refinement of motor functions. Delays or deviations in motor skill acquisition may indicate underlying neurodevelopmental conditions, such as Autism Spectrum Disorder (ASD), where both fine and gross motor domains are frequently affected (Fournier et al., 2010).

Children diagnosed with Autism Spectrum Disorder (ASD) frequently exhibit notable impairments in fine motor proficiency compared to their typically developing counterparts. These impairments can affect various dimensions of functioning, including everyday self-care activities, educational performance, and interpersonal engagement. In recent years, research

has expanded our understanding of the extent and potential mechanisms underlying these motor impairments. Children on the autism spectrum often face significant difficulties with activities requiring fine motor coordination, such as hand-eye synchronization, manipulation of objects, and handwriting tasks. For instance, a study employing the Jebsen-Taylor Hand Function Test and the Nine-Hole Peg Test demonstrated that children with ASD scored lower than typically developing peers in postural stability, balance, and fine motor control (Tunç et al., 2020).

Similarly, a study involving children with ASD aged 4 to 6 reported that 96.6% exhibited below-average motor performance. Moreover, the research identified a negative correlation between the severity of autistic traits and motor functioning (Uluyol & Yanardağ, 2018). In a multinational investigation covering children aged 4 to 14, participants demonstrated challenges in gross and fine motor coordination, as well as balance difficulties. Additionally, symptoms such as impulsivity, hyperactivity, and language impairments were found to adversely affect motor skill development (Belaire et al., 2020).

Fine motor competencies are not only essential for executing manual tasks, but they are also interconnected with cognitive functioning and executive processes. For example, a study focusing on 2-year-old children with ASD revealed that fine motor skills were linked to the ability to switch tasks, though no significant association was found with inhibitory control, emotional regulation, or strategic planning (Wang & Lee, 2025).

Moreover, motor proficiency is closely linked to other developmental domains. Coordinated movements often support cognitive, communicative, and social development. For instance, the ability to point or gesture not only requires motor coordination but also facilitates joint attention and language acquisition. Therefore, motor skill development plays a foundational role in the overall developmental profile of a child (Kangarani-Farahani et al., 2024).

Motor skills serve as the basis for not only physical growth, but also social engagement, environmental research, and mental growth (Adolph & Hoch, 2019). Children with Autism Spectrum Disorder (ASD) have major deficiencies in this area, which affects their everyday performance and social integration. Latest research indicates that children with ASD struggle not only with speech and social interaction, but also with motor development (Fournier et al., 2010; Bhat, 2020). These motor problems typically appear in early childhood and are commonly neglected. Despite this, motor impairments have a significant impact on a child's capacity to act separately, care for themselves, and engage productively with their surroundings.

Table 1.3.1. The characteristics of motor development during first three years

Age, average height,average weight	Motor development
BIRTH 7 ½ lbs., 20 in.	Move around a lot, kicks, lifts and turns head, waves arms, etc. Head sags when not supported
1 MONTH 10 lbs., 21 in.	Lifts chin when lying on stomach. Head sags when not supported.
2 MONTHS	Lifts chest when lying on stomach. Holds head when held.
3 MONTHS	Steps when held erect. Holds head erect and steady. Turns from side to back. Reaches for objects but misses them. Hands mostly open; no grasp.
4 MONTHS	Sits with support. Hands open and close. Stares at and shakes objects held in hands.
5 MONTHS	Sits on another's lap. Rolls from back to side. Grasps objects but without using thumbs.
6 MONTHS 16 ½ lbs., 26 in	Sits in high chair. Uses hands for support when sitting alone. Reaches with one hand. Grasps dangling objects. Moves objects from one hand to the other.
7 MONTHS	Sits without support. Attempts to crawl. Rolls from back to stomach.
8 MONTHS	Stands with help. Crawls (arms pulling body and legs). Uses thumb in grasping. Picks up small objects with thumb and fingers.
9 MONTHS	Stands holding on to furniture.
10 MONTHS	Sits up easily. Pulls up to stand. Creeps (arms and legs alternate, body free).
11 MONTHS	Creeps on hands and feet. Walks when led.
12 MONTHS 22 lbs., 30 in.	Seats self on floor. Walks a few steps without help. Holds and releases a ball.
13 MONTHS	Crawls up stairs.
14 MONTHS	Stands alone.
15 MONTHS	Walks alone.
18 MONTHS 24 lbs., 32 in.	Runs awkwardly and falls a lot. Pulls and pushes toys. Throws ball. Fills a spoon but spills when inserting in mouth.
24 MONTHS 27 ½ lbs., 34 in.	Walks smoothly; runs with legs apart. Walks alone upstairs and down jumps. Builds tower of three blocks. Turns pages of a book.
30 MONTHS 30 lbs., 36 in.	Stands on one foot. Walks on tiptoe. Jumps from chair.
36 MONTHS 32 lbs,.38 in.	Rides tricycle. Tiptoes. Runs smoothly. Walks up and down stairs, one foot on each step. Buttons and unbuttons.

Initially, the infant's sucking is an instinctive response to the insertion of an object in or near the mouth. The infant will establish itself naturally and effectively for the thing. The eyes will close, and motor activity will slow (Gardner, 1978). Children's physical and motor development follows a regular pattern during their first three years of life. On the other hand, monthly developmental milestones and typical height and weight indicators are simply approximate guides. It is quite typical for children to improve at different rates—some may proceed faster or slower, or differ in size—without signaling any developmental issue (Halverson, 1931; Shirley, 1922; Watson & Lowrey, 1967) (see Table 1.3.1).

According to the Portage Guide to Early Education (1976), the typical progression of motor development occurs in alignment with age-related milestones. During the first year of life (0–12 months), an infant demonstrates the ability to maintain head and chest stability while being supported with one arm. The child begins exploring and identifying objects through tactile and oral exploration—grasping items and bringing them to the mouth. When lying prone, the infant gradually gains the ability to roll laterally and eventually supine. As gross motor coordination advances, the child attempts to move by dragging the body using a single limb and later begins to roll sideways while lying on the back. With assistance, the child can transition into a seated posture by gripping an adult's fingers and can independently rotate the head when the torso is stabilized. Around this period, the infant can maintain a seated position for up to two minutes. The release and retrieval of objects become increasingly deliberate, reflecting cognitive maturation. Standing becomes feasible when substantial physical support is provided. In an upright stance, the child is capable of flexing the knees and returning to a standing position with aid. If a desired object is within reach, the child may utilize a part of the body for balance and initiate crawling toward it. The transition from sitting to crawling becomes achievable with support. When prone, the child is able to push upward using the arms and transition into a seated position. Eventually, the infant acquires the ability to sit independently without external assistance. Spontaneous object-throwing may emerge, alongside rhythmic rocking while positioned for crawling. The child can transfer items between hands while seated and grasp small cubes (approximately 2 cm in size) in each hand concurrently. Kneeling becomes voluntary, and the child begins to self-initiate this posture. The child is also capable of pulling up into a standing position by leveraging nearby objects for support. With continued refinement of fine motor abilities, the use of the thumb and index finger (pincer grasp) allows more precise handling of small items. As crawling continues, the child is increasingly able to interact with the surrounding environment. Gradual improvement reduces the necessity for support while standing. Additionally, tongue mobility, such as licking around the lips, signifies further fine motor

coordination. The child can remain standing unassisted for approximately one minute, topple containers filled with objects, and partially fill a spoon. Object placement into containers and movement from squatting to sitting positions are also noted. The child may exhibit hand-clapping behavior and, at this point, requires minimal assistance to initiate walking (Bluma, Susan M, 1976).

Bluma and Susan outlined the key milestones associated with motor skill development in children between the ages of 12 and 24 months. During this stage, a child typically begins to take several independent steps and may also develop the ability to crawl up stairs—an important indicator of early motor progression (Bluma & Susan, 1978). The child can rise unaided from a seated posture and demonstrates an emerging interest in interactive activities, such as rolling a ball, often learned through observation and imitation of others. Motor development continues to advance through activities that require greater strength and coordination, such as climbing onto a large chair and experimenting with inversion movements (e.g., turning upside down). Simultaneously, hand-eye coordination—a domain intrinsically linked with motor development—undergoes notable improvement. At this stage, children are often capable of performing tasks such as stacking rings on a rod, removing and reinserting pegs into a perforated board, building towers with three blocks, and making spontaneous markings with a crayon or pencil on paper. Gross motor milestones include walking independently, descending stairs by crawling, sitting unaided on a small chair, and transitioning between sitting and standing positions without assistance. While the child may still require support to ascend stairs, simple movements such as bending to retrieve objects from the ground are typically well-established (Gardner, 1978).

In children diagnosed with Autism Spectrum Disorder (ASD), delays or impairments in these motor milestones—particularly in actions such as bending and standing—may be observed. Nonetheless, many children with ASD do attain the ability to execute circular or rotational movements, indicating that motor development, although often atypical, still progresses in these individuals, albeit with a unique developmental trajectory.

According to the Portage Guide to Early Education, specific motor skill milestones are expected to emerge between the ages of 24 and 36 months. During this developmental period, children typically acquire the ability to jump with both feet, walk backwards, and manipulate simple mechanisms, such as lowering a door handle. Activities involving reciprocal ball play, such as tossing and catching, are common at this stage and support both gross motor coordination and social interaction. Fine motor skills become increasingly refined, enabling the child to turn the pages of a book individually and to engage in age-appropriate self-help tasks. These include the independent use of utensils such as spoons and cups, and the ability

to open certain types of packaging. Furthermore, children at this stage can put on and remove their own shoes and clothing, demonstrating growing independence and functional motor control. Play becomes more sophisticated, often involving manipulative toys that require coordinated movement between components, thereby reinforcing both cognitive and motor development. The development of fine motor dexterity, particularly the pincer grasp—the coordinated use of the thumb and index finger—lays the groundwork for later writing skills and the proper use of writing instruments, such as pencils or crayons (Bluma & Susan, 1978).

Between the ages of 3 and 4, children typically demonstrate more advanced motor development. Fine motor coordination enables them to cut along paper using scissors and to walk on their tiptoes, reflecting increased neuromuscular control and precision (Bluma & Susan, 1978). By this age, children are often capable of cutting a straight line approximately 20 cm in length, showcasing significant progress in hand-eye coordination and manual dexterity. As the child nears the age of 5, gross motor abilities become more refined, allowing for greater postural stability and balance control. At this stage, children can often stand on one leg unassisted for approximately 4 to 5 seconds and navigate across a balance beam or board. These abilities are indicative of improved vestibular and proprioceptive functioning. Further developmental milestones include the ability to jump forward and backward consecutively—up to 10 times—without losing balance, mold simple figures using modeling materials such as plasticine, cut along curved lines, and operate a tricycle, all of which demonstrate enhanced motor planning and bilateral coordination. In addition, early drawing skills emerge during this stage, supported by the maturation of fine motor control. Children begin to create basic representational drawings, such as depictions of houses, people, and trees. These drawings reflect both cognitive representational ability and increased control over hand movements (Portage Guide to Early Education, 1978).

Drawing upon empirical findings and field-based observations, it can be inferred that motor skill development constitutes a critical aspect of a child's overall growth trajectory. In children diagnosed with Autism Spectrum Disorder (ASD), impairments in both gross and fine motor domains have a detrimental impact on their social engagement, everyday functioning, and level of autonomy. Practical experience indicates that substantial improvements in motor functioning can be achieved through timely interventions and individualized support strategies. The advancement of motor abilities extends beyond physical coordination, playing a pivotal role in fostering cognitive, interpersonal, and emotional competencies. Consequently, integrative and multidisciplinary efforts aimed at enhancing motor skills are essential for unlocking and optimizing the developmental capacities of children on the autism spectrum.

1.4. Developmental characteristics of speech skills

People meet their requirements by sustaining social communication with others using language and speech skills. Language development and cognitive capacities form a well-established, mutually supporting link during early life. The acquisition of speech is essential for developing relationships with other abilities. Linguist Roman Jakobson (1960) proposed six core communicative functions that language fulfills throughout human development:

1. Conative. Language is used to express intentions, requests, and needs. For example, a child asking for an apple demonstrates a conative use of language.
2. Emotive. Language serves to convey internal emotional states. A child's laughter, a father's irritation, or a mother's verbal expressions of affection all illustrate emotive communication.
3. Referential. The primary purpose of language is to describe objects, events, and circumstances in the external world. Children frequently engage in this function by asking “What is that?” as they explore their surroundings.
4. Phatic. This often overlooked but crucial function involves using language to establish or maintain social contact. For example, when a mother says “hmm” in response to a child’s talk, it serves as a cue that she is present, attentive, and encouraging continued interaction.
5. Metalinguistic. Language can also be used to comment on or analyze itself. Questions like “What does that word mean?” or “What are you saying?” represent metalinguistic awareness. Most academic discourse in linguistics is inherently metalinguistic, including this very explanation.
6. Poetic. While metalinguistic language refers to language itself, the poetic function is when language draws attention to its own form or aesthetic. A child delighting in the repetition of playful sounds like “teeber, belber, bee-bee” exemplifies the poetic use of language.

Lev Vygotsky (1986) underscored the significant function of language in the intellectual growth of children. He regarded language not just as a mode of communication, but also as a central mechanism for social engagement and the conveyance of information. As per Vygotsky's perspective, language first develops within a communal framework—through the child’s interactions with their environment—and eventually evolves into internal speech, which serves as the core foundation of cognition. This internal dialogue helps structure and manage the child’s mental operations. Hence, language functions not only as a medium for

articulating ideas but also as an essential tool in shaping them. Vygotsky further pointed out that caregivers and adults utilize language as the principal channel for imparting knowledge and sharing experiences with children. Through this dynamic, outward experiences are absorbed through linguistic means and transformed into internal cognitive operations, thereby promoting the child's personal intellectual development. Lev Vygotsky (1986) highlighted the indispensable function of language in the mental development of young learners. He perceived language not merely as a tool for conveying information, but as a foundational instrument for social engagement and the dissemination of cultural understanding. In Vygotsky's view, language originates through interactive experiences—within a communicative setting involving parents, educators, and peers—and progressively evolves into private speech, which plays a crucial role in shaping cognitive processes. This internal speech acts as the medium through which children structure, manage, and evaluate their own mental activities. Therefore, language is not just a mirror of thought but a critical mechanism in its formation. Vygotsky further maintained that adults hold a central role in children's educational development by utilizing language as the main vehicle for imparting knowledge and directing mental processes. Through interactions mediated by language, external experiences are absorbed and transformed into internal mental functions, thereby fostering the child's unique cognitive advancement. An essential element of Vygotsky's framework is the concept of the Zone of Proximal Development (ZPD)—which represents the gap between what a child can accomplish independently and what they can attain with guidance from a more capable individual. Within this developmental space, language acts as a scaffold, enabling the child to engage in advanced levels of thinking that would otherwise be inaccessible. In this model, learning is conceptualized as a socially facilitated endeavor, where language not only supports knowledge acquisition but also cultivates the child's ability to solve problems independently. As these scaffolded interactions are gradually internalized, the external support is reduced, allowing the child to operate cognitively on their own (Lev Vygotsky, 1986).

Humans have long and proudly proclaimed that language sets us above all other animals. "When we study human language," asserted linguist Noam Chomsky (1972), "we are approaching what some might call the human essence, the distinctive qualities of mind that are, so far as we know, unique" to humans. The cortex of the left hemisphere of the brain is primarily important for language and speech development. The interplay of the cerebral hemispheres is responsible for most mental and psychic functions. At about twenty weeks the brain has developed to a certain point, the organism may be considered a "psychological "as well as a "biological" creature: in addition to acting, the fetus may also perceive and feel. It is

extremely difficult, however, to determine what information is being perceived by the sense organs of the fetus and what feelings the fetus experiences. The hearing mechanism seems well developed during the latter months of fetal life (Gardner, 1978). The fetus' ability to detect and respond to sounds is dependent on the development of the auditory system during 26 weeks in the placenta. In other words, the early phases of a baby's language and speech development begin during pregnancy. In addition to the brain, the respiratory organs, specifically the tongue, lips, and lungs, play an important part in speech production. Three functions contribute to the occurrence of speech: breathing, phonation, and articulation. The air that enters the lungs through respiration vibrates the vocal cords in the larynx through phonation, and the sound produced by articulation, when passing through the mouth and nasal cavity, forms different sounds with the help of organs such as the tongue, lips, teeth, and soft palate, resulting in speech activity. Each sound requires a different articulation shape and place. Wernicke is responsible for sound comprehension, whereas Broca is in charge of sound creation in the primary motor cortex. The evolution of language is separated into two stages:

1) Pre-language and speech stage

2) Language and speech stage

The pre-language and speech stage lasts the first 12 months of a baby's life after birth. The emotional and social reactions that the newborn need from the mother following birth might be regarded as the foundation of the baby's motivation for interacting. This period starts with the baby communicating through facial expressions and gestures. The conclusion of the period is related to the appearance of the first words. The baby, who has recognized the mother's voice during the prenatal period, begins to behave differently when hearing it. The pre-language and pre-speech stages consist of sub-periods (Gardner, 1978).

The first sub-period, which covers the period of 0-2 months, is the reflexive period. The beginning of the first speech activity is the baby's cry at birth. The repetition of crying sounds, the search for food, sucking, swallowing reflexes, breathing, mouth, tongue, and lip movements are considered as preparations for the formation of sound. The cries of a newborn baby in the first three weeks are reflex cries, but the cries in the second three weeks are considered different and are considered as pain, hunger, sleep cries. Also, during this period, they make about 16-17 different sounds such as yawning, coughing, sneezing, and sighing. The child needs to recognize that spoken language consists of a finite number of recurring speech sounds (phonemes); however, this awareness alone is not adequate for acquiring language. It is equally essential for the child to perceive the sequence and structure in which these individual sounds and clusters of sounds are organized. The following sub-period is the cooing period, which lasts 2-4 months. The baby is aware of the sound he makes and is

pleased with it. During this time, the baby does not need to hear the sounds he produces. They make sounds like "a, i, u" first, then "a, o, u" by prolonging the vowels and adding "h" at the end, producing sounds like "aaah", "oooo", "uuuh", and soft palate and larynx noises like "s, k, g". Sound production remains reflexive, revealing both satisfaction and dissatisfaction with meaning. These cooing noises, heard in babies all around the world, are unlearned common sounds that serve as the foundation of language. Babies recognize the importance of certain noises at this period and begin to smile particularly when they hear their mother's voice (David G. Myers,1989).

The following sub-period is the babbling period, which lasts 4-6 months. Babbling does not represent a replication of adult speech, as it contains sounds (phonemes) from numerous languages, including those that are absent from the native language spoken at home—for instance, French, Korean, or Ethiopian. Infants who are deaf also engage in babbling, despite not being able to mimic spoken language they have perceived (Fromkin & Rodman, 1983). It appears that this exploratory vocalization is inherently programmed into the brain. It is a time in which the baby's influence over the vocal mechanism strengthens and he starts repeating the noises he formulates, which is known as vocal play. By combining vowels and consonants, he learns how to make two-syllable sounds like "mama, baba". The sounds are no longer reflexive; instead, they are intended to represent something. When the newborn is 6 months old, he can understand the basic sounds of his native language and begins to communicate with those around him. The repetitive period of babbling lasts 7-9 months. Babbling sounds include "Anana", "nananan", "baba bab", and "adada". All children around the world form these sounds. Parents interpret these phrases as important since they are similar in timing to words said by adults. Nevertheless, these words, known as "repeated" or "redublicated babbling," are not recognized as meaningful words. During this time, babies respond to spoken words by smiling or producing sounds, and they begin to discern between sounds of satisfaction and anger. A period of 9-11 months involves copying the sounds of others. Babies are increasingly starting to copy adults meaningfully. Babbling gradually begins to mirror the distinctive sounds and speech patterns of the language spoken at home. By approximately 10 months of age, the infant’s vocalizations typically reflect the specific language of their environment. At this stage, phonemes that are unfamiliar or unrelated to the child’s native language tend to fade away. Meaningless noises evolve into flowing, direct, rapid, mumbling sounds, often known as jargon. The ability to imitate is an essential component of language and speech development. It is thought that enhancing newborns' ability to imitate sounds promotes the generation of related sounds. During this period, babies might start to repeat the lengths of syllables and the timing of their pronunciation to adults.

While the baby keeps on babble, he also learns novel phrases, which give place to new words that are slowly lost, and with the first word, the pre-language and pre-speech stage ends (David G. Myers,1989).

The first subperiod of the language and speech period lasts 11 to 18 months. Children reply adequately to requests during this period, and pointing is essential There are two kinds of pointing. The first form is called proto-imperative pointing. That is, the child points proto-imperatively at an object or food that an adult needs, showing a desire to declare, "I need this." The second type is protodeclarative pointing. That is, the child utilizes his index finger or stares to direct the adult's attention to what he wants. This is also necessary for joint attention. Typically, the first words that babies speak are names of objects, living things, or people that they encounter frequently. At this age, children can employ their own sounds to describe animate or inanimate objects, like "bu" for water and "chi" for flower. At first, infants only utilize short syllables, but by the age of 18 months, they can say most multi-syllable words as single-syllable words. They aim to communicate an entire sentence with a single word. This is known as morgem. Children everywhere start using verbs, adjectives, and adverbs in the same order after nouns. During this period, kids understand more words than they pronounce. That is, their receptive language ranks higher than their expressive language, which is speech.

The period of combining words, or employing two-word sentences, lasts 18 to 24 months. As children's vocabulary expands, they communicate by combining two words composed of a noun and a verb, with no other elements of speech and only one meaning for the child. Then, phrases with three words, such "bring mom food" or "drink mom water," start to be made use of correctly, even if they do not follow grammatical norms. While vocabulary grows slowly until 18 months of age, it expands significantly between 18 and 22 months, reaching fifty words. The first grammatical period spans ages of two to three. A child can already build sentences with significance, even if they are uncompleted, using only 3-4 words. He starts using conjunctions like "or", "or". This is the period when the infant begins to understand and follow orders, as well as answer simple questions, while also reacting by changing the tone of his voice when he is satisfied or unsatisfied. According to grammatical norms, speech ages range from three to six years old. At this age, children's attention has grown, and they are already engaging in significant and lengthy discussions. And the word they hear from the initial moment captures their interest. in this period, children start to investigate the cause and effect of an event, use question marks like "why, why," comprehend and use time-related words like "above, below, and under," describe events in past, present, and future tenses, and understand and use comparative words like "smaller, longer." A child

between the ages of four and five knows approximately 1,000 words. At the age of 5-6, a child may freely talk with an adult. When a child reaches school after receiving early childhood development, he or she gains improved language and speech abilities. Throughout school, the child has the capacity to comprehend difficult and abstract concepts. He can compose a text after mastering his reading and writing skills. As the speech structure improves, he may create logical sequences and cause-effect links. As a stage of development of language, it includes both receptive language is understanding what is being said by another person (Gardner, 1978).

There are developmental characteristics of receptive language according to age. A 2-month-old baby turns his head to loud sounds. A 4-6-month-old baby follows the source of the sound with his eyes. A 9-month-old baby looks when his name is called, and his understanding of words increases. There are social skills such as the imitation-based "bye-bye" and "cee" game. At 12-18 months, he understands single instructions such as "give it to me". At 1-2 years old, he can point to his body parts when asked. At 2 years old, he understands dual instructions such as "wash your hands and sit at the table". At 3 years old, they can understand the questions "what, who, where, why". At 4 years old, they can understand what adults are saying. At 5 years old, they understand letters, numbers, and digits. Expressive language is expressing what they want to say through speech. receptive and expressive language. Initially receptive language is developed. After achieving a certain degree, expressive language speech develops. Indeed, the gap between receptive and expressive language levels becomes increasingly narrow around the age of two. Speech, which is a typical expressive language based on age, has distinct characteristics related to development. A two-month-old infant is cooking and babbling. A normally growing 3-month-old infant communicates with his parents using a variety of sounds. A 4-month-old baby produces bilabial sounds (such as b, p, and m). At five months, he speaks in more meaningless single syllables. Babbling begins about 6-8 months of age. First, receptive language is formed. After reaching this appropriate level, expressive language speech forms. In fact, the difference between receptive language and expressive language levels closes around 2 years of age. Speech, which is normal expressive language according to age, also has different developmental characteristics. A 2-month-old baby has been cooking and babbling. A normally developing 3-month-old baby communicates with his parents by making various sounds. A 4-month-old baby makes bilabial sounds (such as b, p, m). At 5 months, he says more meaningless single syllables. At 6-8 months, babbling begins. At 9 months, he utters 2-3 syllables or jargon. At 12 months, meaningful single words begin. From 1 year of age, the speed of word learning is replaced by 1 word per week towards 2 years of age, which is

replaced by one word per day. At 18 months, he has an average of 10-50 words and jargon. At 2 years, he has 200-300 words and 2-syllable sentences. At 3 years old, they have 3- and 4-syllable sentences. Seventy-five percent of what they say is meaningful. At 4 years old, they can understand short stories. At 5 years old, they begin to use tenses and conjunctions. In general, language development is affected by factors such as genetics, health status, family environment, environment, and socio-economic status. Prenatal environmental factors include smoking, alcohol, abnormal fetal development, poverty, and malnutrition during pregnancy. Postnatal factors include premature birth, poverty, unemployment, physical illness, sleep disturbances, etc. (Gardner, 1978).

Children diagnosed with Autism Spectrum Disorder (ASD) often exhibit notable deviations in speech and language development compared to their typically developing counterparts. These distinctions are apparent not only in the structural components of language—such as phonological patterns, grammatical constructions, and syntactic organization—but also in the pragmatic dimension, which pertains to the functional use of language in social communication. The range and progression of linguistic abilities in children with ASD are highly heterogeneous; while some may remain nonverbal, others may demonstrate fluent speech yet show atypical or idiosyncratic language use in social contexts. A significant number of children with ASD experience considerable delays in the onset of speech, with some not developing functional spoken language altogether. The acquisition of first words or phrases typically occurs later than expected based on their developmental milestones. Children on the autism spectrum frequently experience significant challenges in both comprehending and utilizing gestures, particularly when compared to their typically developing peers. The core element of early social communication—index finger pointing—is often delayed or absent in autistic children and typically emerges only as a result of intentional therapeutic intervention. Furthermore, deficits in play skills, which are commonly observed, contribute to a narrow range of interests. Nevertheless, with the implementation of structured training programs or therapeutic support, some children begin to acquire basic play competencies, which subsequently promote an increased awareness of and engagement with the external environment. As this sense of curiosity and environmental interest expands, so too does the child's motivation to interact with others and to seek desired items, thereby stimulating the emergence of communicative intentions. Research on children with autism have shown that improving both receptive (understanding) and expressive (speaking) language skills can have a beneficial effect on cognitive development (Gözütok, 2021). Unlike their usually developing peers, children with autism frequently face impairments in speech development. However, these delays are rarely related to issues with the physical

structure or operation of the speech mechanism. Rather, they stem from issues with social communication. Toddlers on the autism spectrum can seem to neglect speech, acting as if they do not hear people speaking. Nonetheless, when toddlers need to convey a desire, they frequently use nonverbal tactics, like grasping an adult's hand and directing it toward the thing they desire. This shows that the fundamental issue is not a lack of speaking capacity, but rather a misunderstanding of speech as a tool for social engagement. Speech is frequently absent or limited, serving largely to address immediate needs rather than facilitating social involvement. These youngsters often escape communication and show no intrinsic motivation to learn new words or form sentences (Akgül, 2022).

Children with autism who have developed speech often struggle with the correct use of tenses, morphemes, and the third person. A study by Bartolucci and Albers, involving children aged 3 to 6, examined three groups: children with typical development, those with developmental delays, and children with autism. The way words are organized to construct phrases, clauses, and full sentences is referred to as syntax. Individual terms do not exhibit syntactic structure on their own; however, grammatical patterns begin to emerge when words are arranged together. The ordering of elements within a spoken or written expression, along with the relationships between different types of expressions—such as declarative sentences, directives, and interrogatives—are all components of the syntactic system. The results showed that children with autism made more errors in using tenses, syntax, and morphemes compared to the other groups, which made their speech harder to understand (Örkcün-Akçamuş, 2016).

Experts suggest that delays in these language skills contribute to delays in social communication. Alongside difficulties in speaking, children with autism may also face problems in understanding spoken language. Whether they are conversing with another child on the spectrum or with a typically developing person, their speech often relies on repetitive, automatic phrases. Some children with autism may learn to read as they develop speech; however, due to limited comprehension, this reading process does not become functionally meaningful (Topçu, 2017).

The underdevelopment of speech in early childhood also limits their social communication abilities. One of the most prominent and distinguishing aspects commonly observed in children diagnosed with autism is the atypical trajectory of speech development. In certain cases, verbal language may not emerge at all, whereas in others, spoken communication may develop, albeit with unusual and non-normative patterns. A particularly prevalent speech phenomenon among autistic children is echolalia, often referred to as "repetitive or echoic speech", characterized by the repetition of previously heard phrases or utterances. Echolalia, defined as the recurrence of language previously spoken by others, can

manifest in two primary temporal forms: immediate echolalia, where repetition follows the original statement within seconds, and delayed echolalia, where repetition may occur after hours, days, or even months. This speech behavior can further be categorized into four subtypes: (1) exact repetition of entire utterances (complete echolalia), (2) partial repetition or modified segments of speech (mitigated echolalia), (3) immediate imitation of verbal input, and (4) postponed reproduction of speech content. It is important to emphasize that these types are not exclusive, and a child may simultaneously demonstrate multiple echolalic patterns, such as both immediate and delayed responses. While echolalia is generally considered an aspect of atypical language development, it is not necessarily permanent. With the implementation of targeted therapeutic strategies, many children show notable progress in overcoming or reducing echolalia. Clinical evidence suggests, however, that in certain cases, echolalic tendencies may reappear during times of heightened emotional stress (Genç-Tosun, 2021). The purpose and function of echolalia remain subjects of ongoing scholarly debate. Some theorists interpret it as a tool for communication, while others regard it as a repetitive or ritualistic behavior pattern. Crucially, as a child's receptive language and comprehension skills improve, a decline in echolalic behavior is often observed. In fact, some perspectives classify echolalia as a developmental phase within the broader process of speech acquisition in children on the autism spectrum (Örkcün-Akçamuş, 2018). A particularly interesting finding is that some speaking children with autism might spend long periods of time repeatedly singing songs or echoing sentences they hear on the radio or television. While previously viewed as non-functional, emerging research indicates that echolalia may serve communicative purposes, particularly in early developmental stages. Additionally, many children with Autism Spectrum Disorder (ASD) exhibit prosodic abnormalities, including unusual pitch, rhythm, stress, or intonation patterns. Their speech may sound robotic, overly musical, or emotionally disconnected from the conversational context, posing further challenges to effective social interaction. Since poor social communication is a core symptom of autism, these delays in language development can lead to an increased severity of the disorder in children (Örkcün-Akçamuş, 2018). While echolalia is the most frequent speech disorder observed in children with autism, other disorders such as stuttering, alalia, dyslalia, and more can also be present.

One of the core linguistic impairments associated with Autism Spectrum Disorder (ASD) involves pragmatic language abilities—that is the capacity to utilize language appropriately within social contexts. Despite their language abilities, they do not use speech unless absolutely required. One of the most common linguistic issues seen in speaking autistic children is inappropriate usage of personal pronouns. Instead of stating "I want water," a child

may use their own name and refer to oneself in the third person (Yörükoğlu). A significant number of children diagnosed with ASD exhibit grammatical limitations and syntactic irregularities, including frequent mistakes in pronoun usage (such as saying "you" instead of "I"), simple sentence structures, and non-standard word arrangements. Individuals on the autism spectrum often experience difficulties initiating and maintaining conversations, establishing or sustaining eye contact, and modifying their speech according to social cues or context. These social challenges are not solely attributable to cognitive deficits; in fact, such difficulties may play a contributory role in the emergence of cognitive complications over time. While these issues are typically more pronounced in early childhood, they can evolve into behavioral patterns wherein the child either exhibits passive social engagement or demonstrates idiosyncratic, one-sided interaction styles. Social adaptability and interpersonal functioning are regarded as strong indicators of long-term developmental outcomes. Even in cases where children achieve what is termed an “optimal outcome,” subtle social untypicalities may still persist. Some early theories on the origins of autism were informed by the peculiar language patterns noted in affected individuals—particularly their avoidance of first-person pronouns like “I” or “me,” in favor of third-person alternatives such as “he” or “she.” For example, when asked, “Do you want something to drink?” a child with ASD may respond, “He wants something to drink,” despite intending to say, “I want something to drink.” Such anomalous speech behavior led some researchers to hypothesize that autism might be associated with diminished self-awareness (Goldfarb, 1963; Mahler, 1952). These theorists posited that the social detachment observed in autism could arise from a deficiency in recognizing one’s own existence or selfhood. Moreover, children on the spectrum often encounter challenges in grasping figurative language, such as metaphors, irony, idiomatic expressions, and humor. Their interpretation of language tends to be literal and concrete, which inhibits their ability to comprehend abstract or nuanced meanings. These linguistic limitations are closely tied to the Theory of Mind (ToM) framework. ToM, a fundamental aspect of social cognition, has received extensive scholarly attention over the past four decades, particularly in clinical psychiatric research. It is considered a crucial skill for effective social functioning, as it enables individuals to infer and understand the beliefs, thoughts, and emotions of others. The development of Theory of Mind is associated with various neurodevelopmental milestones, especially within the first six years of life. Insights from neuroscience have highlighted the roles of specific brain regions—such as the limbic and paralimbic systems, the prefrontal cortex, and the mirror neuron system—in facilitating the growth of this ability.

The Verbal Behavior (VB) approach, also known as Applied Verbal Behavior (AVB), is grounded in the theoretical principles proposed by B.F. Skinner in his seminal 1957 work, Verbal Behavior. This methodology is specifically designed to foster language acquisition in children with Autism Spectrum Disorder (ASD) by employing behavioral learning strategies to enhance communication abilities. The primary goal of the VB method is to teach children how to articulate their needs and identify items in their environment. At the initial stage of intervention, the emphasis is placed on enabling the child to communicate their wants and needs, whether through spoken words, nonverbal cues, pointing, or alternative communication methods. These gestural behaviors serve as the primary channel through which the child can convey needs and preferences, thereby laying the foundation for the development of expressive speech. This phase is widely recognized as a critical precursor to the acquisition of verbal language skills. Through the implementation of a strategically structured and personalized intervention plan, the child's inherent drive to communicate—along with emerging foundational abilities—can be effectively leveraged to facilitate the gradual development of vocal sounds, syllabic utterances, and ultimately meaningful spoken language. Once this foundation is established, the child is gradually introduced to labeling or naming their desired items or experiences. This systematic approach allows the child to develop discrete skills associated with each communicative function (Tohum Autism Foundation, 2012).

Examples of such skill development include:

- Requesting water when experiencing thirst
- Pointing to water when prompted
- Naming "water" in response to the question "What are you drinking?"
- Answering the question "What do you wash your hands with?"

Once these fundamental communicative behaviors are established, a more comprehensive instructional plan is devised to help the child attain advanced language and social communication skills. The Verbal Behavior method is frequently applied in combination with other educational and therapeutic approaches to maximize effectiveness (Ünlü, Bozkurt, Genç-Tosun, Karabekir, Eyiip, Bozkuş Genç, Töret, Kısaç, Gönen, 2020).

Semantics is a subfield of linguistics that investigates the relationship between language elements and their corresponding meanings or references in the real world. In addition to the fundamental components of phonology, syntax, and semantics, it is also essential to examine the pragmatic functions of language—how it is used in communication.

The most remarkable aspect of children at the ages of two, three, or four—and perhaps the most influential—is their proficiency in verbal expression. Over the course of several

months, they develop the ability to articulate desires, pose inquiries, obey instructions, and even comprehend narratives. Shortly thereafter, they begin forming advanced phrases and inventing original stories of their own.

During the early childhood period, young children also begin to navigate the social landscape, especially by observing the conduct and ethical beliefs of their parents. They mimic the behaviors they witness, reproduce the language they hear, and adopt the principles and norms endorsed by others; more broadly, they begin to align their identity with that of their caregivers. In this phase, children also acquire gender-role awareness. Moreover, they absorb the behaviors sanctioned by society into their moral framework and sense of right and wrong.

Although both language development and social progress are essential, children at this stage are particularly known for their imaginative nature. Through play, preschoolers experiment with various identities, attribute fantastical qualities to objects, and explore the intersection of imagination and reality. This process may serve as a fundamental bridge between purely sensory-motor activity and the use of symbolic thought.

CHAPTER II. METHODS AND METHODOLOGY

2.1. Organization and procedures of the study

The investigative procedure was segmented into four distinct phases. The initial phase entailed formulating the study's framework. Subsequently, a research approach was established. Implementation of the study commenced in the second phase, during which data were collected and input into a computerized system. The guardians of each child with autism were informed about the objectives of the study and granted the opportunity to decline involvement. Consequently, all individuals partaking in the study offered voluntary informed consent. The selection of participants adhered to predefined inclusion criteria. During the third phase, the gathered information was systematically organized, analyzed, and subjected to statistical processing. The final phase involved consolidating the findings into a cohesive dissertation.

The research was carried out at the Rehabilitation Department of the NEFES Psychoneurological Center in Azerbaijan, where participants had been diagnosed with Autism Spectrum Disorder (ASD) by a qualified psychiatrist. This facility specializes in the interdisciplinary treatment of children with neurodevelopmental conditions. The inclusion criteria for participants were as follows:

1. A confirmed diagnosis of ASD.
2. Age range within the early developmental period (0–6 years).
3. Presence of speech and motor impairments.

A total of 60 children were involved in the research, consisting of 18 girls and 42 boys, all receiving intervention services at the center. The children ranged in age from 22 months to 6 years at the time of data collection. Importantly, the sample included children who were initially flagged as being at risk for developmental delays and subsequently received formal ASD diagnoses. In such cases, data collected prior to the official diagnosis—such as observations made at 22 months—were incorporated to allow for a longitudinal perspective on early development.

Two standardized instruments were employed, each assessing specific developmental areas. These tools were selected based on their reliability, adaptability, and proven effectiveness in evaluating the progress of children with ASD. In this research, the evaluation of motor development in children with Autism Spectrum Disorder (ASD) was carried out using the Psychoeducational Profile – Revised (PEP-R). The fine motor subscale included 16 specific items, while the gross motor domain was assessed through 18 targeted items,

enabling a detailed observation of both small muscle coordination and large body movements. To measure speech and language abilities, the study applied the Portage Guide to Early Education, which encompasses 123 items covering various aspects of verbal communication. These items range from foundational communicative behaviors to more advanced linguistic functions, providing a comprehensive profile of each child's speech development.

Each instrument was administered individually using a structured observational method conducted by the researcher. Observations were embedded in routine therapy sessions, ensuring a familiar and non-threatening environment. Behavioral responses and communicative acts were documented using structured note-taking and observation sheets aligned with the domains of each tool.

This naturalistic observation approach was particularly suitable for the ASD population, as it minimized anxiety and accommodated common sensory sensitivities. Observational methods ensured that the findings reflected genuine behaviors and developmental potential, rather than performance on traditional tests.

Once collected, the data underwent two principal forms of analysis:

- Descriptive Statistics: Frequencies, means, and standard deviations were calculated to depict the developmental characteristics of participants across motor and speech domains.
- Correlational Analysis: Pearson's correlation coefficient was used to evaluate the relationship between motor development (via PEP-R) and speech abilities (via Portage Guide). This facilitated the identification of whether advanced motor performance was associated with more developed language skills, and vice versa.

All ethical standards for research involving minors were rigorously followed. Prior to initiating the study, ethical clearance was obtained, and procedures were aligned with international research ethics, including the Declaration of Helsinki. Confidentiality was maintained through anonymization and coding of participant data. The study was conducted from May 2024 to April 2025, following protocol decision 2024-25-2 No. of Khazar University.

The legal guardians of all participants were thoroughly briefed on the research aims, methods, duration, and voluntary nature of involvement. Written consent was obtained from each child's parent or guardian, affirming that ethical and scientific standards—especially those pertaining to research with vulnerable populations—had been met. Participation was entirely voluntary, and guardians were informed of their right to withdraw their child at any point without negative consequences.

All data were handled with the utmost confidentiality. Children's identities were safeguarded through anonymization and secure coding. Results were reported in aggregate to prevent the identification of any individual. No intrusive or distressing procedures were employed. All observations were conducted in secure, familiar, and supportive environments. If a child exhibited signs of discomfort or withdrawal, the session was paused or adapted to better align with their emotional well-being.

These safeguards ensured the study was conducted with both scientific integrity and ethical diligence, conforming to the highest standards required for developmental research involving young children with autism.

2.2. The psychodiagnostics methods of the research

The main psychodiagnostics methods are these:

1) The Psychoeducational Profile-Revised (PEP-R)
2) The Portage Guide to Early Education

Standardized assessment tools, including the Psychoeducational Profile-Revised (PEP-R) for motor skills (fine and gross motor) and the Portage Guide to Early Education for speech skills, were used to gather data.

Information about PEP-R

The Psychoeducational Profile-Revised (PEP-R) is a standardized diagnostic instrument for determining the developmental level and individual abilities of children with autism spectrum disorder (ASD) and other developmental problems. Developed by Eric Schopler and colleagues, it was later modified and broadened as part of the TEACCH (Treatment and Education of Autistic and Communication Handicapped Children) program. The instrument's items were derived from a broad array of tasks utilized with children on the autism spectrum. The revised edition, known as the Psychoeducational Profile-Revised (PEP-R), represents an updated form of this diagnostic tool (Schopler, Reichler, Bashford, Lansing, & Marcus, 1990).

PEP-R is tailored to assess children diagnosed with pervasive developmental disorders (PDDs) from 6 months to 7 years of age, although it may be applied to individuals up to 12 years old who exhibit developmental delays. This instrument enables evaluators to determine the child's developmental stage and readiness for learning across 131 items, categorized into seven developmental domains. The PEP-R method consists of two main parts:

- Developmental Scale – assesses the child's skills in seven main domains:
    1. Imitation (16 items)

2. Perception (13 items)
3. Fine motor (16 items)
4. Gross motor (18 items)
5. Eye-hand coordination (15 items)
6. Cognitive functioning (16 items)
7. Verbal and nonverbal communication skills (27 items)

- Behavioral Scale – assesses the child's skills in four main subdomains:
  1. Relationship and emotion (12 items)
  2. Interest in play and materials (8 items)
  3. Sensory responses (12 items)
  4. Language (11 items)

  This psychometric assessment stands out due to several distinctive attributes:
  - Assessment of Emerging Abilities: PEP-R evaluates not only established and absent competencies but also emergent skills, thus offering a more holistic view of the child's developmental progress.
  - Developmental Quotient over IQ: Rather than employing Intelligence Quotient (IQ) scores—which may be less informative for autistic individuals, the PEP-R provides a Developmental Quotient (DQ), better suited to measure progress in this population.
  - Limited Linguistic Demand: Given the prevalence of language deficits in autism, the tool is structured using simple language, and many components are non-verbal, thereby ensuring a more accurate appraisal of abilities.
  - Developmentally Structured Items: Test items are ordered hierarchically, from simpler to more complex, mirroring typical developmental sequences.
  - Data-Driven Design: The tasks were refined over a decade of practical application with autistic children, ensuring strong empirical grounding.
  - Reliability: Schopler et al. (1990) validated the reliability of the PEP-R through two distinct evaluation methods, yielding consistent outcomes across assessments.

  Administration Guidelines:

Prior to implementation, practitioners must gather all required materials and become thoroughly acquainted with the instructions and item content. Building a trusting relationship with the child—potentially through calming preliminary activities—is recommended. If the child displays signs of disengagement or stress, short breaks or simpler items should be introduced. A child-friendly environment should be arranged for tasks focusing on social interaction.

The test components are grouped by the materials needed and sequenced developmentally, progressing from easier to more advanced tasks. Although the sequence is adaptable, assessors typically proceed in numerical order. If a child demonstrates competency at a comparable difficulty level, the examiner may record the item as "passed" without formal testing. The PEP-R was specifically constructed with attention to the unique developmental paths of autistic children. Requiring tasks that exceed the child's developmental level may provoke behavioral disturbances. The assessment's flexible administration structure permits customization to suit individual differences.

Scoring Methodology:

Developmental items are rated on a three-tiered scale:

- Passed: The child independently completes the task.
- Emerging: The child exhibits partial comprehension but requires support or cannot finish the task autonomously.
- Failed: The child does not attempt or is unable to complete the task, even with assistance.

Behavioral items are evaluated as:

- Typical, Mildly Atypical, or Markedly Atypical.

Under certain conditions, specific items may be omitted.

Each scoring sheet includes spaces to log results for all 11 subdomains. The total number of "Passed" items contributes to the child's developmental profile and helps determine their developmental age. "Emerging" scores are likewise tracked to pinpoint skill areas requiring targeted intervention, thus serving as a foundation for constructing an individualized education program (IEP).

Information about Portage

The Portage Guide to Early Education is a developmental and educational tool designed to assess and promote learning in young children with special educational needs, including those with autism spectrum disorder (ASD) and other developmental disabilities. Originating in the 1970s in Portage, Wisconsin, USA, it was developed by a multidisciplinary team to support families in implementing individualized, home-based teaching. Over time, the tool has been revised and internationally adapted, gaining prominence in early childhood intervention programs (Bluma et al., 1976).

The Portage Guide is designed for children from birth to 6 years of age, though it may also be applied to older children with developmental delays. It is particularly effective for children with pervasive developmental disorders, communication difficulties, and motor or cognitive delays, and can be implemented in home or early education environments. Its

inclusive and family-centered approach makes it suitable for use across diverse populations and settings.

The guide consists of a developmental checklist encompassing over 580 skill items divided across five core developmental domains:

1. Socialization and Interpersonal Relationships
2. Language and Communication
3. Cognition (Problem-Solving and Concept Development)
4. Motor Development (Fine and Gross)
5. Self-Help and Daily Living Skills

Each domain is further broken down into specific behaviors or tasks that represent age-appropriate developmental milestones. Skills are sequenced hierarchically—from simple to more complex—mirroring typical patterns of child development.

The Portage Guide stands out due to its systematic, family-centered, and developmentally sensitive approach. Key attributes include:

- Task Sequencing: Skills are arranged from simpler to more advanced, allowing for step-by-step instruction.
- Focus on Emerging Skills: The guide does not solely assess what a child can or cannot do; it emphasizes skills that are in progress ("emerging").
- Parent Empowerment: The guide actively involves parents and caregivers in both assessment and intervention, turning them into primary facilitators of the child's development.
- Natural Learning Environments: Instruction is embedded in everyday home routines, making learning functional and relevant.
- Adaptability: The tool is flexible and allows for individualized instructional strategies based on each child's unique strengths and challenges.
- Developmental vs. Normative Approach: Rather than comparing children to standardized norms, it focuses on individual developmental progression, thus avoiding inappropriate expectations.

Administration Guidelines

Prior to implementation, practitioners review the checklist and engage caregivers in discussing the child's current behaviors. The steps typically include:

- Gathering background information through parent interviews.
- Observing the child in natural routines and daily activities.
- Using the developmental checklist to determine current, emerging, and absent skills.

- Selecting a small number of teachable targets (usually 3–5 skills) based on observations and family priorities.
- Coaching parents or caregivers to practice skill-building activities in everyday situations.

Progress is reviewed regularly (typically every 4–6 weeks), and new goals are selected as previous ones are mastered. The process is cyclical and collaborative, ensuring the intervention is dynamic and tailored to the child's evolving needs.

Scoring Methodology

Each skill item is scored based on the child's performance and is classified into one of the following categories:

- Achieved: The child can perform the skill independently.
- Emerging: The child demonstrates partial or inconsistent ability to perform the skill.
- Absent: The skill is not yet present.

These scores are documented within the child's developmental profile. Progress is charted over time, and results are used to develop an Individualized Education Plan (IEP) that targets both short- and long-term goals.

Relevance for Children with Autism Spectrum Disorder (ASD)

The Portage Guide is especially beneficial for children on the autism spectrum due to its:

- Structured and Predictable Format: Which aligns with the learning preferences of children with ASD.
- Focus on Communication and Social Skills: Two of the core areas impacted autism.
- Integration into Daily Routines: Helping generalize skills in real-life contexts.
- Visual and Concrete Learning Tasks: Which are suited for children with difficulties in abstract thinking.
- Parental Involvement: Which fosters consistency, repetition, and emotional security.

Its flexible, child-led pacing and home-based implementation reduce stress and behavioral resistance that often occur in clinical or rigid settings.

CHAPTER III. ANALYSIS OF OBTAINED DATA

3.1.Analysis of descriptive statistics

Descriptive statistics provide an essential foundation for understanding the distribution, central tendency, and variability of key variables prior to performing inferential analyses. In the context of this study, descriptive statistics were calculated for the variables of age (in months), fine motor development, gross motor development, and speech development. These domains reflect critical aspects of early childhood development, particularly among children diagnosed with Autism Spectrum Disorder (ASD).

Table 3.1.1. The descriptive analysis of the developmental data

Measure	Month	Fine Motor	Gross Motor	Speech
Count	60	60	60	60
Mean	45.15	9.37	12.08	30.65
Standard Deviation	16.31	3.77	4.96	29.46
Minimum	22	0	1	0
25th Percentile	31	7	8	5.75
Median (50th %)	45.5	10	13.5	21
75th Percentile	56	12	16	47.5
Maximum	80	17	18	109

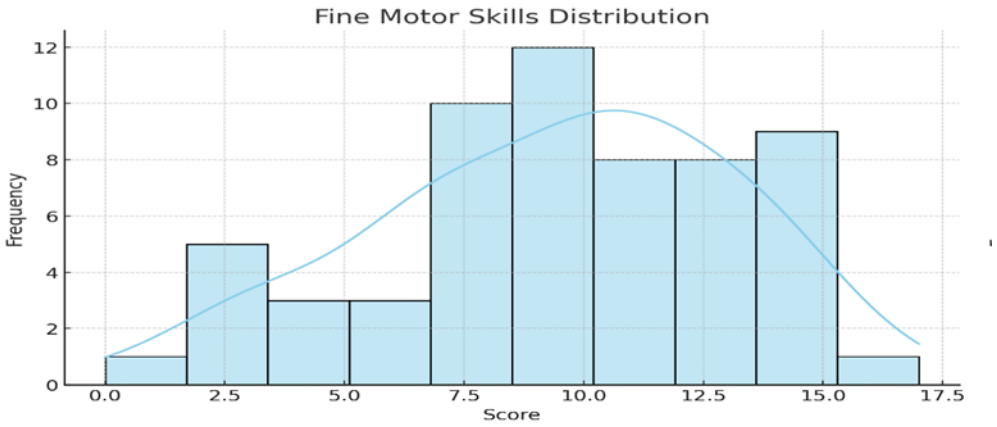
The sample consisted of 58 children between the ages of 22 and 80 months, encompassing a wide developmental range. The variable “Month” (age) ranged from a minimum of 22 months to a maximum of 80 months, with a mean age of approximately 47.26 months and a standard deviation of 13.20. This suggests that the sample included both toddlers and preschool-aged children, which is particularly relevant for evaluating early developmental trajectories in ASD (See Table 3.1.1.).

In terms of motor development, fine motor skills exhibited scores ranging from 0 to 17, with a mean value of 9.58 (SD = 3.83). This indicates moderate development on average, with some children displaying severely limited fine motor abilities, while others demonstrated near-age-appropriate or advanced skills. Gross motor development scores varied between 1

and 18, with a mean of 12.69 (SD = 4.41), reflecting a slightly higher average level of gross motor coordination compared to fine motor skills. These findings are consistent with prior literature, which often notes that gross motor functions tend to develop more robustly in children with ASD than fine motor precision, which typically requires more refined neuromuscular control (Bhat et al., 2011).

The most substantial variability was observed in the domain of speech development, with scores ranging from 0 to 109 and a mean score of 28.16 (SD = 26.60). The wide range and high standard deviation underscore the heterogeneity of language abilities in children with ASD. While some participants were non-verbal or minimally verbal, others demonstrated considerable speech output. This aligns with extant research suggesting that language development in children with ASD is highly variable and influenced by factors such as early intervention, cognitive level, and co-occurring conditions (Tager-Flusberg & Kasari, 2013).

Taken together, the descriptive statistics highlight the broad spectrum of developmental capabilities within the ASD population studied. The findings also emphasize the need for individualized assessment and intervention planning, as children show diverse strengths and needs across motor and speech domains. These variations further support the conceptualization of autism as a spectrum disorder, with significant differences in developmental profiles across individuals (American Psychiatric Association [APA], 2013).

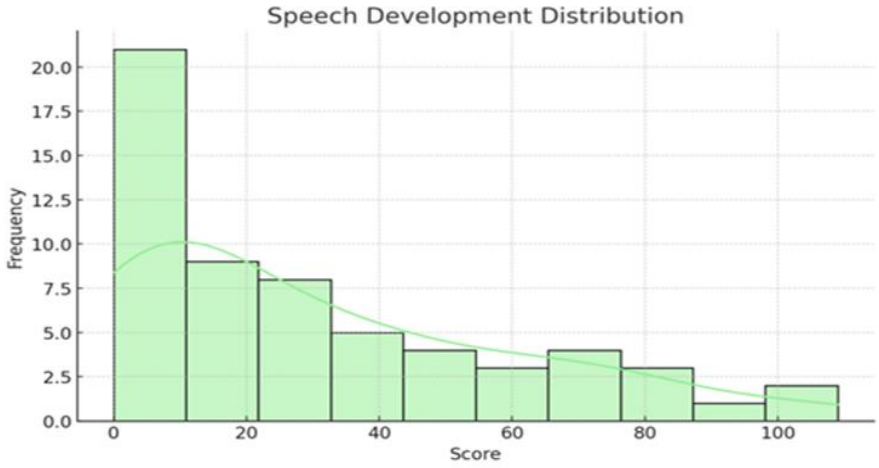


Graph 3.1.1. Speech development distribution

The histogram indicates that the majority of children's "Fine Motor" scores are clustered between 6 and 14. Although the distribution of scores is approximately symmetrical, some children exhibit low values such as 0 and 2. This suggests a developmental delay in fine motor skills in certain children (See Graph 3.1.1).

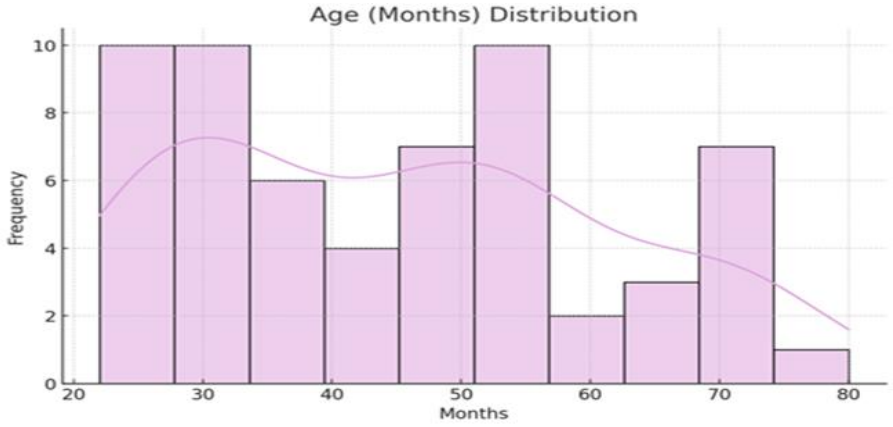
Graph 3.1.2. Gross motor skills distribution

The histogram for "Gross Motor" skills shows that scores are predominantly concentrated between 12 and 18, with the highest frequency observed in the 14–16 range. This indicates that gross motor skills are relatively well developed in most children. However, a few participants also display low scores such as 1, 4, and 5, suggesting that some children experience delays in gross motor development (See Graph 3.1.2).



Graph 3.1.3. Speech Development distribution

The histogram for speech skills displays a wider and more asymmetric distribution. There is a significant gap between low scores (0–10) and high scores (60–110), indicating substantial variability in speech development among children. While some children are still in the early stages of speech acquisition, others demonstrate advanced levels of speech proficiency (See Graph 3.1.3).



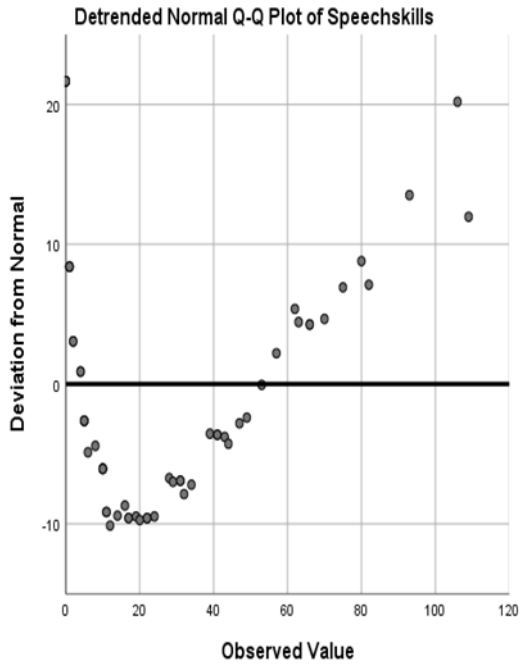
Graph 3.1.4. Age (Months) distribution

The age histogram shows that the majority of children fall within the 22 to 80-month range, with peak frequency observed between 45 and 55 months. This indicates that most participants in the study are around 4 to 5 years old. Being within this age interval is appropriate for the early developmental stage, which corresponds to the period when both speech and motor skills are actively forming (See Graph 3.1.4).

This descriptive analysis reveals that locomotor abilities—especially those involving large muscle groups—are generally well-established among most participants. On the other hand, fine motor coordination shows a broader range of differences, with a subset of children presenting indicators of delayed progress. Language development stands out as the most diverse area, reflecting the wide-ranging patterns of speech acquisition typical in children with Autism Spectrum Disorder (ASD). Lastly, the age range of the cohort affirms that the investigation was carried out within a suitable developmental stage for early childhood, a crucial phase for the emergence of both communicative and motor functions.

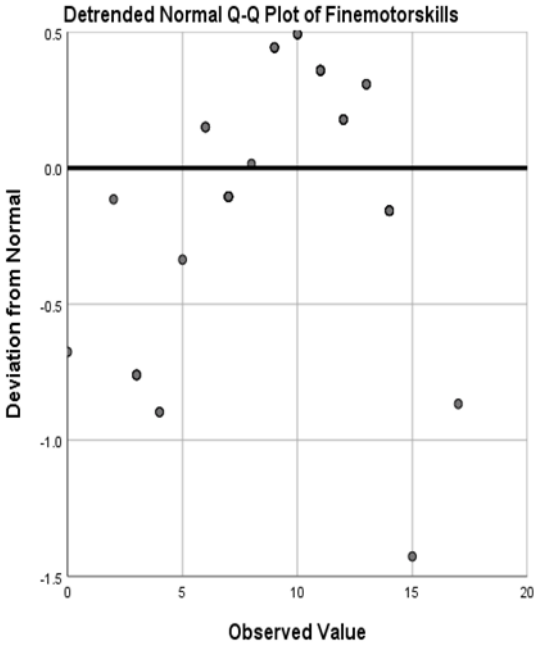
3.2. Analysis of correlation

The results were analyzed with SPSS version 16.0. The significance level was ($p < 0.05$). The significance was determined using the p-value. The bivariate correlation, Sperman's coefficient, was employed to assess the relationship between indicators. A group participated in the study. Both the motor and speech skills of the children in the group were assessed. Subsequently, the normality of the data for both variables was assessed using the Shapiro-Wilk test, Q-Q plots, and histograms. The distribution of data on speech and fine motor skills were not normal (See Graph 3.2.1. and Graph 3.2.2.). Therefore, in order to examine the relationship between speech development and fine motor skills in children diagnosed with autism spectrum disorder, the Spearman correlation analysis was used. The statistical findings derived from the analysis are presented in Table 3.2.1.



Graph 3.2.1. Detrended Q-Q Plot Assessing Normality of Speech Skills Scores

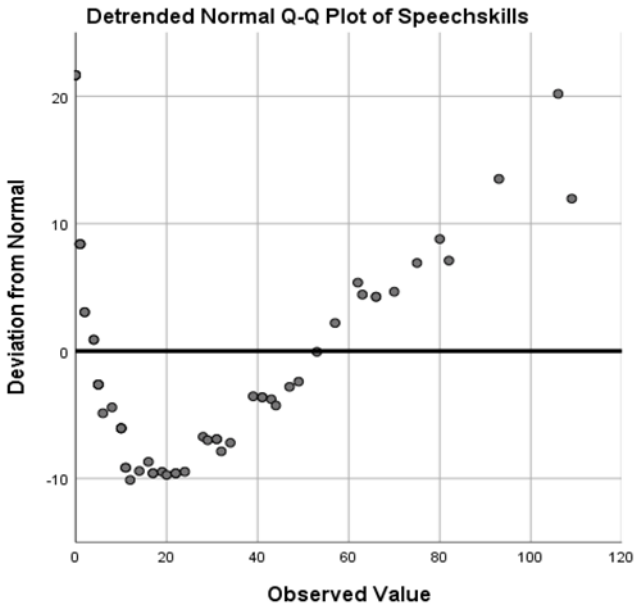
Detrended Q-Q Plot Assessing Normality of Speech Skills Scores (See Graph 3.2.1.) displayed above demonstrates the extent to which the empirical speech development scores diverge from a theoretically normal distribution. In an ideal normal distribution, all data points would cluster symmetrically around the horizontal line representing zero deviation. However, the current pattern reveals systematic discrepancies from normality. Within the lower spectrum of observed scores (approximately under 40), the majority of points fall beneath the baseline, signifying negative deviations. This suggests that children's speech skill scores in this range are lower than statistically anticipated under the assumption of normal distribution. Conversely, in the upper segment of the score range (approximately above 60), the values tend to lie above the reference line, reflecting higher-than-expected performance.The curvilinear and asymmetrical configuration of the data implies a non-normal, positively skewed distribution. This indicates that a larger portion of children scored below the mean, with fewer individuals achieving exceptionally high speech development scores. Such a distribution may be characteristic of children with Autism Spectrum Disorder (ASD), where inconsistencies and developmental delays in speech are frequently observed. Recognizing this departure from normality is critical for determining the suitability of statistical methods. Given these findings, the use of non-parametric statistical tests or data transformation techniques may offer a more accurate approach to analyzing speech-related outcomes within this population.



Graph 3.2.2. Detrended Q-Q Plot for Fine Motor Skills

The detrended Q-Q plot above illustrates the discrepancies between the observed fine motor skill scores and the values expected under a normal distribution (See Graph 3.2.2.). In a perfectly normal distribution, the data points would cluster closely around the horizontal line at zero, indicating minimal deviation from normality. However, the plot shows a noticeable pattern of deviations. Several data points at the lower end of the observed values fall below the zero line, suggesting that those scores are lower than expected under normal conditions. Meanwhile, some mid-range and higher observed values rise above the line, indicating positive deviations. This non-random pattern, including both negative and positive deviations, suggests that the distribution of fine motor skill scores departs from normality. The irregular spread of the points implies potential skewness or kurtosis in the data, meaning that the scores are not symmetrically distributed. Such a pattern is important to consider when selecting statistical methods, as it may warrant the use of non-parametric tests or data transformation techniques in subsequent analyses.

The normality of the data for both variables was assessed using the Shapiro-Wilk test, Q-Q plots, and histograms. The distribution of data on speech and gross motor skills were not normal (See Graph 3.2.3. and Graph 3.2.1.). Therefore, in order to examine the relationship between speech development and gross motor skills in children diagnosed with autism spectrum disorder, the Spearman correlation analysis was used. The statistical findings derived from the analysis are presented in Table 3.2.2.

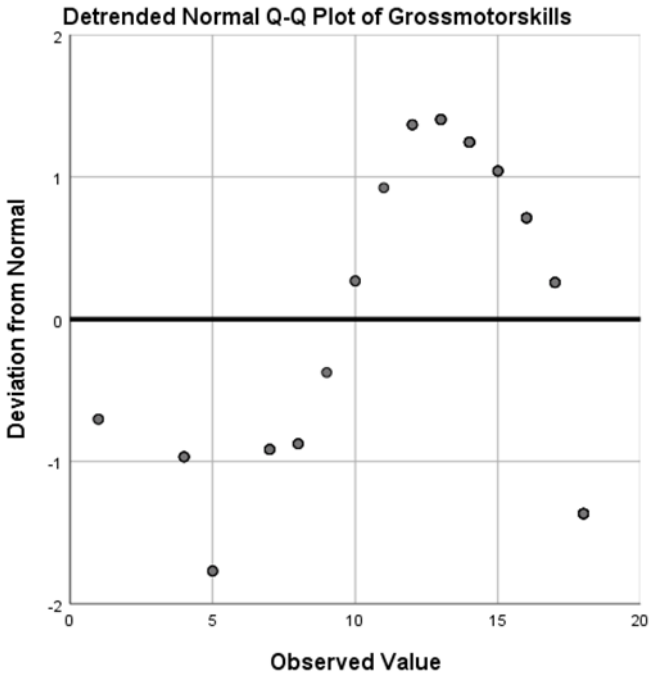


Graph 3.2.3. Detrended Q-Q Plot for Speech Skills

The detrended Q-Q (quantile-quantile) plot for speech skills provides insight into the distributional properties of the collected data in comparison to a theoretical normal distribution (See Graph 3.2.3.). In this visualization, deviations from the horizontal "zero" line indicate the degree to which observed values diverge from what would be expected under a normal distribution. The graph clearly shows that the speech skill scores of the participants substantially deviate from the normality assumption. In particular, the lower observed values—approximately between 0 and 40—demonstrate pronounced negative deviations, falling well below the reference line. This suggests that a significant portion of the children exhibit underdeveloped speech capabilities relative to the normative expectation. Such a concentration of low values is indicative of skewness and developmental delay among many participants. Conversely, at the higher end of the distribution (around 70 and above), the points lie above the reference line, showing positive deviations. This indicates that a smaller subset of children performed substantially better than expected based on a normal distribution, further emphasizing the heterogeneity of speech development within the sample.

The curvature and asymmetric dispersion of data points in the plot confirm that the speech skills variable does not follow a normal distribution. Instead, it displays a positively skewed distribution, meaning the majority of the scores are concentrated on the lower end with a long tail extending toward higher values. This pattern likely reflects the uneven and idiosyncratic nature of speech development in children with Autism Spectrum Disorder (ASD). From a statistical standpoint, this departure from normality has important implications. Many parametric tests assume normality of the data. Given the skewed distribution observed here, it is recommended to either apply non-parametric statistical

methods or consider data transformation techniques to meet the assumptions required for further analysis.



Graph 3.2.4. Detrended Normal Q-Q Plot for Gross motor skills

The scores are distributed across a wide range, with a concentration between 10 and 18. This indicates that motor abilities are well developed in the majority of children(See Graph 3.2.3.).

Table 3.2.1. Spearman's rank correlation between speech and fine motor skills

		Fine motor skills
Speech skills	Spearman r	.763*
	p	.000
	n	58

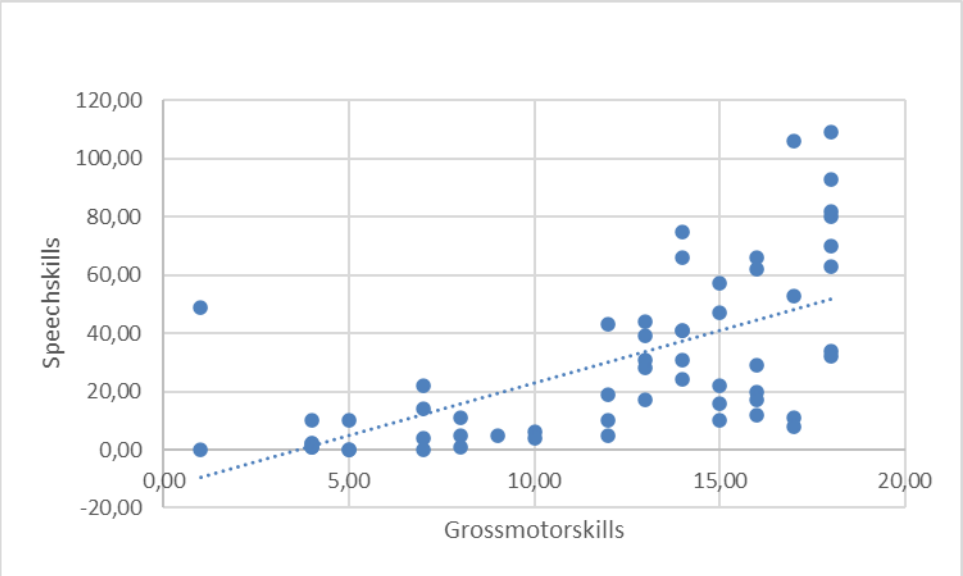
A strong and statistically significant positive correlation ($r = 0.763$, $p < 0.05$) was found between speech skills and fine motor skills. This indicates that participants' speech and fine motor abilities tend to increase together in a meaningful and correlated manner. The shared variance between these two variables is 0.87, suggesting that 87% of the development in speech skills may be attributed to the level of fine motor skills. The relationship is presented in (See Table 3.2.1)

Table 3.2.2. Spearman's rank correlation between speech and gross motor skills

		Gross motor skills
Speech skills	Spearman r	.713*
	p	.000
	n	58

** The correlation is statistically significant at the 0.01 level (p < 0.01).*

A strong and statistically significant positive correlation (r = 0.713, p < 0.05) was found between speech skills and gross motor skills. This indicates that participants' speech and fine motor abilities tend to increase together in a meaningful and correlated manner. The shared variance between these two variables is 0.84, suggesting that 84% of the development in speech skills may be attributed to the level of fine motor skills. The relationship is presented (See Table 3.2.2).



Graph 3.2.5. Scatter plot of the relationship between speech and fine motor skills.

The scatter plot provides a visual representation of the positive relationship between fine motor skills and speech development in children diagnosed with Autism Spectrum Disorder (ASD). Each data point reflects an individual child's scores in both domains, revealing an upward trend that suggests a meaningful association between the two variables. As fine motor

abilities—such as grasping, hand-eye coordination, and manual dexterity—improve, there is a corresponding increase in verbal communication skills. This pattern supports the growing body of research indicating that motor development and language acquisition are interlinked processes, particularly during early childhood. Since the distribution of the data does not meet the assumption of normality, the Pearson correlation coefficient—which requires interval-level data and normally distributed variables—was not considered appropriate for theanalysis. Instead, Spearman's rank-order correlation, a non-parametric alternative that does not assume normal distribution and is suitable for ordinal or non-normally distributed interval data, was employed. This method allowed for the assessment of the strength and direction of the monotonic relationship between gross motor skills and speech abilities among the participants.

This table presents the Spearman's rho correlation coefficients between age (in months), gross motor skills, fine motor skills, and speech skills for a group of 58–59 participants. There is a strong positive correlation ($\rho = .750$, $p < .01$), indicating that as children grow older, their gross motor skills tend to improve significantly. A strong positive correlation ($\rho = .640$, $p < .01$) is observed, suggesting that fine motor skills also develop with age. The correlation is moderate ($\rho = .504$, $p < .01$), meaning that older children tend to have better speech skills, but the relationship is not as strong as with motor skills. There is a very strong correlation ($\rho = .776$, $p < .01$), showing that these two types of motor skills are closely linked in development. A strong correlation ($\rho = .713$, $p < .01$) indicates a notable relationship between physical movement capabilities and speech development.

Table 3.2.3. Spearman's rank correlation between age, speech, fine and gross motorskills

Correlations						
			Age with months	Gross motor skills	Fine motor skills	Speech skills
Spearman's rho	Age with months	Correlation Coefficient	1.000	.750**	.640**	.504**
		Sig. (2-tailed)	.	.000	.000	.000
		N	59	59	59	58
	Gross motor skills	Correlation Coefficient	.750**	1.000	.776**	.713**
		Sig. (2-tailed)	.000	.	.000	.000
		N	59	59	59	58
	Fine motor skills	Correlation Coefficient	.640**	.776**	1.000	.763**
		Sig. (2-tailed)	.000	.000	.	.000
		N	59	59	59	58
	Speech skills	Correlation Coefficient	.504**	.713**	.763**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	58	58	58	58
**. Correlation is significant at the 0.01 level (2-tailed).						

A very strong positive correlation ($\rho = .763$, $p < .01$), suggesting that improvements in fine motor skills are closely associated with better speech abilities. All the correlations are statistically significant at the 0.01 level (2-tailed), indicating strong interdependence between age, motor development, and speech skills. Notably, fine motor skills have the highest correlation with speech skills, supporting the theory that motor development—particularly fine motor control—is closely tied to language acquisition, especially in children with developmental differences such as autism (Table 3.2.3).

RESULTS

The outcomes of the investigation exploring the association between speech and motor proficiency in children diagnosed with Autism Spectrum Disorder (ASD). Data were gathered from a cohort of 58 participants aged between 22 and 80 months and subjected to statistical processing via SPSS version 16.0. The threshold for statistical relevance was established at $p < .05$. Preliminary descriptive analytics offered essential insights into the developmental attributes of the sample population. Participant ages spanned from 22 to 80 months, with an average age of 47.26 months and a standard deviation of 13.20. This reflects that the cohort encompassed both toddlers and preschool-aged children, a pivotal stage for linguistic and motoric maturation. Scores pertaining to fine motor coordination ranged between 0 and 17, yielding a mean value of 9.58 (SD = 3.83). This denotes a moderate level of refinement in manual dexterity on average, albeit some children displayed profound impairments. In contrast, gross motor capability scores varied from 1 to 18, with a comparatively higher mean of 12.69 (SD = 4.41), indicative of stronger proficiency in large-scale bodily movement across the majority of participants. These observations are consistent with prevailing scholarly discourse asserting that fundamental gross motor functions in children with ASD often emerge more robustly than intricate fine motor control, which demands advanced neuromuscular regulation.Speech development exhibited the greatest degree of fluctuation, with score values extending from 0 to 109 and a mean of 28.16 (SD = 26.60). The considerable standard deviation illustrates a wide dispersion in language acquisition skills, wherein certain children were non-verbal or minimally articulate, while others demonstrated considerably more sophisticated verbal competencies. This substantial variability underscores the heterogeneous nature of speech progression within the ASD population and reflects influences such as cognitive profile, early therapeutic engagement, and concurrent developmental disorders. Histographic representations corroborated these descriptive findings. The bulk of fine motor performance clustered between scores of 6 and 14, though a subset of individuals registered scores as low as 0 or 2, signifying marked deficiencies. Gross motor proficiency was largely concentrated between 12 and 18, with the majority exhibiting relatively high functionality, although a minority registered as low as 1, 4, or 5. Linguistic abilities were highly dispersed across the spectrum; while some achieved scores ranging from 60 to 110, others recorded values below 10, attesting to the expansive variability in expressive capacity among the cohort. Age distribution was densest between 25 and 60 months, with a modal range of 45 to 55 months, confirming that the bulk of the sample was situated within a

critical neurodevelopmental interval for motor and speech growth. Subsequently, the assumption of data normality was evaluated through the Shapiro-Wilk diagnostic, Q-Q visualizations, and frequency histograms. These analyses revealed that the distribution patterns for both linguistic and motor variables deviated from Gaussian norms. Specifically, detrended Q-Q plots for speech exhibited positive skewness, with a preponderance of participants scoring below the mean and a minority attaining exceptional scores. Parallel anomalies were observed for fine motor data, which displayed both subnormal and supranormal deviations relative to the normal curve, confirming non-symmetric distributional characteristics. Due to the non-parametric nature of the dataset, Spearman's rank-order correlation coefficient was utilized to evaluate the degree and directionality of associations among variables. A robust and statistically meaningful positive correlation ($\rho = 0.763$, $p < .01$) was identified between speech output and fine motor function. This finding suggests that enhancement in manual precision is closely tied to improvements in verbal expressiveness. The coefficient of determination indicated a shared variance of approximately 87%, highlighting a strong interconnection between these two developmental dimensions. A similarly pronounced positive association ($\rho = 0.713$, $p < .01$) emerged between speech production and gross motor coordination, with an 84% overlap in variability, implying that overall physical agility contributes substantively to language development.

Graphical depictions via scatter plots substantiated these quantitative outcomes, illustrating a discernible upward linear trend between both categories of motor functioning and verbal ability. Each plotted data point reflected an individual subject's scores, confirming a consistent co-developmental pattern whereby gains in motor control were accompanied by parallel progress in language proficiency. This alignment echoes contemporary research advocating for a holistic understanding of early developmental domains as interdependent and mutually reinforcing. To further elucidate these interrelationships, correlational analyses were extended to include chronological age. A strong positive linkage ($\rho = .750$, $p < .01$) was established between age and gross motor adeptness, while age also bore a significant positive correlation with fine motor capabilities ($\rho = .640$, $p < .01$). A moderate positive correlation ($\rho = .504$, $p < .01$) was documented between age and speech competence, suggesting that maturational progression positively influences all three domains, albeit more variably in speech. Additionally, an exceptionally high correlation ($\rho = .776$, $p < .01$) was found between fine and gross motor skills, signifying the cohesive evolution of overall motor coordination.

Collectively, these results substantiate the proposition that motor development—particularly in fine motor precision—is intrinsically related to the acquisition of linguistic skills in children with ASD. The findings emphasize the importance of integrated

developmental screening and multidisciplinary intervention strategies. Furthermore, the results align with theoretical frameworks that conceptualize language and motor development as interconnected neural systems, particularly salient during early neuroplastic phases of childhood.

Despite its contributions, the study is subject to several constraints. A primary limitation pertains to the modest and non-randomized sample size (N = 58), which may hinder the extrapolation of results to the broader ASD population. The recruitment of participants from a single clinical institution may introduce sampling bias due to uniformity in diagnostic protocols, therapeutic experiences, or sociocultural backgrounds.

Secondly, the cross-sectional design of the study captures developmental variables at a singular point in time, limiting the ability to infer causality or to trace the developmental progression of motor and language abilities. Longitudinal investigations would be better suited to examine how these domains evolve and potentially influence one another over time.

Thirdly, although the PEP-R and the Portage Guide are widely regarded as reliable assessment frameworks, their cultural adaptation and psychometric standardization within the Azerbaijani context remain limited. As a result, certain developmental assessments may be influenced by unaddressed cultural or linguistic nuances, possibly affecting the accuracy of results. Furthermore, the study did not account for other influential variables such as intellectual functioning (IQ), sensory processing difficulties, or comorbid developmental conditions, which could significantly impact both motor and verbal development in children with ASD.

Lastly, although the use of Spearman's rank-order correlation was appropriate given the non-normal distribution of data, it restricts the ability to explore more complex interrelationships among variables. The inclusion of advanced multivariate analyses—such as regression models or structural equation modeling—could provide deeper insights into the underlying mechanisms driving the observed associations.

This investigation yields several noteworthy contributions to the domains of developmental psychology and autism-focused intervention strategies. Firstly, it offers concrete empirical data substantiating a significant relationship between motor skill acquisition—particularly fine motor control—and expressive language abilities in children identified with Autism Spectrum Disorder (ASD). Through the application of non-parametric statistical techniques and the deployment of well-established evaluative instruments such as the Psychoeducational Profile-Revised (PEP-R) and the Portage Guide, the research facilitates a more refined comprehension of the interconnection between motor and communicative development in early childhood.

Secondly, the study provides region-specific insights, particularly relevant to Azerbaijan, where empirical inquiries into ASD remain relatively sparse. By analyzing data from clinically assessed children at the NEFES Psychoneurological Center, this research fills a critical void in the local scientific literature and can act as a preliminary framework for the formulation of evidence-based early intervention initiatives and educational practices.

Thirdly, the findings underscore the significance of comprehensive developmental screening. The identified strong correlation between motor coordination and linguistic proficiency suggests that delays in motor development may function as early warning signs for prospective speech impairments. This reinforces the imperative for interdisciplinary collaboration across clinical, therapeutic, and educational contexts to ensure early identification and holistic intervention planning.

Lastly, the study contributes to ongoing theoretical discourse by lending empirical support to neurodevelopmental models that emphasize the interconnected emergence of motor and speech faculties, rooted in overlapping neural circuits. Particularly during critical periods of neuroplasticity, these findings advocate for the incorporation of motor-focused approaches within speech-language therapy for young children on the autism spectrum.

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APPENDICES

Appendix 1

All tests used in the research were administered by master's student Lamiya Muzaffarli. All participants in the surveys took part voluntarily, and the data obtained in this study is confidential and used solely for research purposes.

PEP-R Qiymət Cədvəli 1

	Davranış				İnkişaf						
Köpük	S	M	SR	D	T	Q	KM	BM	ƏG	K	N
1-Banka qapağını boşaldar											
2-Üfürərək köpük şişirər.											
3- Köpüyü gözü ilə izləyər											
4- Sol gözünün yanından burnuna qədər hərəkət etdirilən köpüyü izləyər											
Əlləri ilə tuta biləcəyi kublar											
5-Kubiklərə maraq göstərər											
Kaleydeskop											
6- Kaleydeskopu manipulasiya edər											
7-Eyni gözü ilə davamlı olaraq baxar											
Zəng çalmaq											
8- Zəngi çalmaq üçün iki dəfə basar											
Plastilin və taxta mismarlar											
9- Barmağı ilə plastilini qarışdırar											
10-Kiçik çöpləri barmaqları ilə alar											
11-Plastilini yumrulayar											
12-Plastilindən çuxur qab düzəldər											

İt və pişik oyuncaqları və əşyalar (qaşıq,fincan,diş fırçası,salfet)

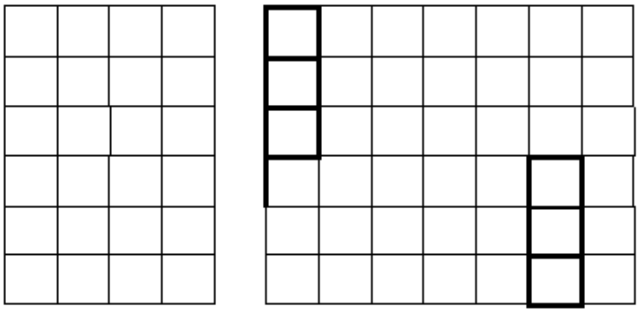
13- Kuklanı manipulasiya edər

14- Heyvan səslərini təqlid edər

15-Əşyalarla hərəkətləri təqlid edər

16- Kuklanın bədən üzvlərini göstərər (göz, burun, qulaq, ağız) (3hissə)

17-Öz bədən üzvlərini göstərər (göz, burun, qulaq, ağız) (3hissə)



18- Kukla ilə qarşılıqlı, qarışıq oyun oynayar

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PEP-R QiymetCədvəli 2

Geometrik Şəkil Taxtası

19- Şəkil taxtasında doğru boşluqları göstərər (3 hissə)

20- Şəkil taxtasına hissələri doğru yerləşdirər (3 hissə)

21- Geometrik şəkilləri adlandırar (3 hissə)

22- Adları deyildiyində doğru şəkilləri göstərər (3 hissə)

Davranış

S	M	SR	D

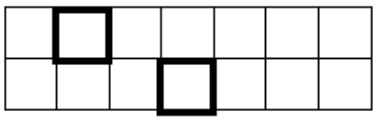
İnkişaf

T	Q	KM	BM	ƏG	K	N

Segen lövhəsi (4 hissəli)

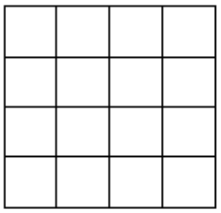
23- Segen lövhəsini tam şəkildə yığar

24- Görüş sahəsində olmayan hissələ götürərək segen lövhəsini bitirməyə çalışar

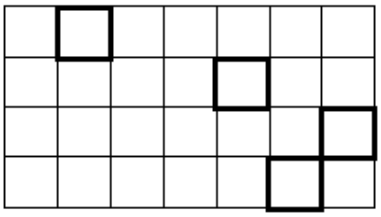


Böyük-kiçiyi göstərən segen lövhəsini bitirər

25- Şəkillərin boşluqlarını böyüklüklərinə uyğun olaraq göstərər



26- Şəkilləri böyüklüklüklərinə uyğun olaraq yerləşirər

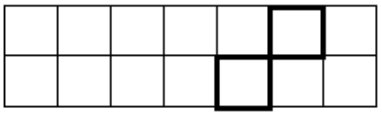


27- Böyük və kiçiyi adlandırar

28- Adı deyildiyində böyük və kiçiyi göstərər

Bir-birinə keçən 4 hissəli Pazl

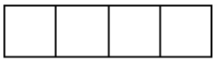
29- Pazl hissələrinin yerini göstərər (əgər 23 - isə, bu da -)

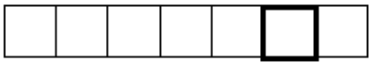


30-Pazl hissələrini birbirinə keçirdərək puzlı bitirər (əgər 3 - isə,bu da-)

6 hissəli Pazl

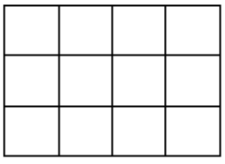
31- 6 hissəli puzlı bitirər (əgər 23- isə, bu da -)



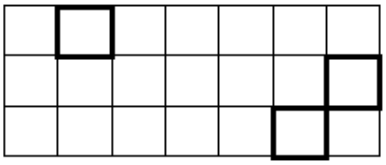


Rəngli dairələr və kubiklər

32-Kubikləri dairələrlə eyniləşdirər (5 ədəd)



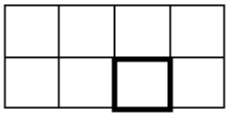
33- Rəngləri adlandırar (5 ədəd)



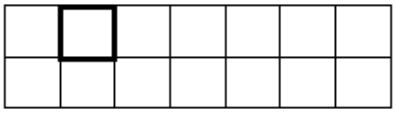
34- Adları deyildiyində rəngləri göstərər (5 ədəd)

Zınqırov

35- Zınqırovun səsini eşidər və ona tərəf dönər



36- Zınqırovun səsinə reaksiya verər



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PEP-R QiymetCədvəli 3

Fiziki məşğuliyyət

37- Tək. sərbəst yeriyər

38- Əl çalar

39- Tək ayağı üstündə hoppanar (əyər 37 - isə, bu da -)

40- İyi ayağı üstündə hoppanar (əyər 7 - isə, bu da -)

41- Böyük motorika hərəkətlərini təqlid edər

42- Sıra ilə baş barmağını

Davranış			
S	M	SR	D

İnkişaf						
T	Q	KM	BM	ƏG	K	N

Top

43- Topu tutar (3 sınaqdan 1də)

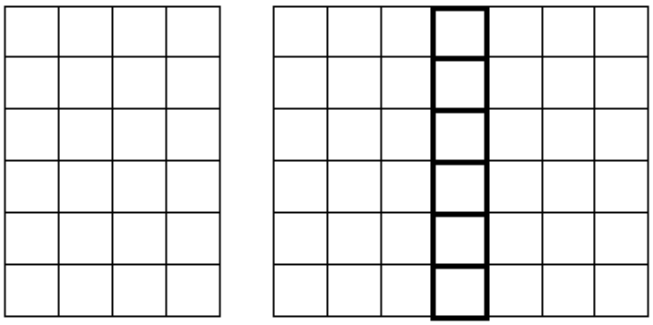
44- Topu atar (3 sınaqdan 1də)

45- Topu ayağı ilə vurar (3 sınaqdan 1də)

46- Eyni ayağını davamlı şəkildə istifadə edər

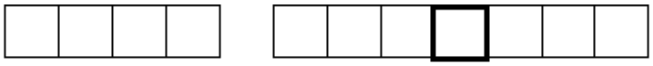
47- Topu daşıyar (4 addım)

48- Topu əli ilə diyirləndirər



Pilləkən

49- iki ayağını eyni anda istifadə edərək pilləkən çıxar

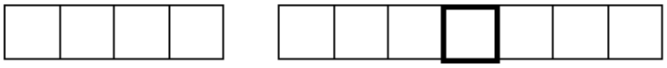


Stul

50- Stula dırmaşaraq oturar

Qaçış aparatı

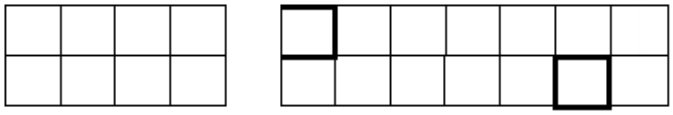
51- Qaçış aparatında özünü hərəkət etdirər



Dəsmal , stəkan və ya ən sevdiyi oyuncaq

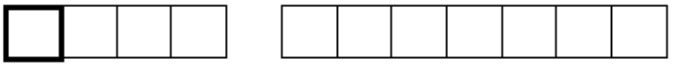
52- Sosial uşaq oyunları oynayar

53- Gizlədilən əşyanı tapar



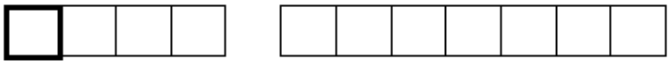
Güzgü

54- Güzgüdəki yansımasına reaksiya verər



Fiziki toxunma

55- Fiziki toxunmaya reaksiya verər



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PEP-R Qiymət Cədvəli 4

Qıdıqlamaq	**Davranış**				**İnkişaf**						
56- Qıdıqlamaya reaksiya verər	S	M	SR	D	T	Q	KM	BM	ƏG	K	N
			■								

Fit

57- Fit səsinə tərəf fırlanar						■					
58- Fit səsinə reaksiya verər			■								

Jest və mimikalar

59- Jest və mimikalara reaksiya verər						■					

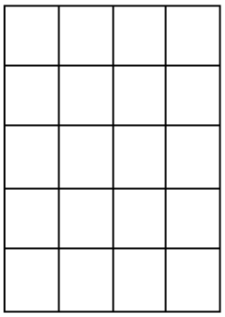
Stəkan və Meyvə suyu

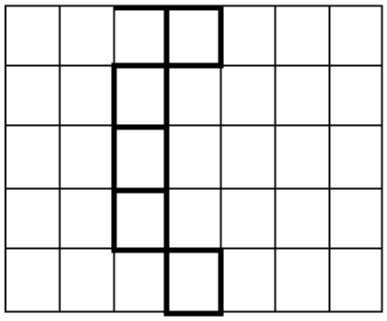
60- Stəkandan su içər								■			

Ağzı bağlı banka və içində sevdiyi əşya

61- Kömək istəmək üçün jestika və mimikalardan istifadə edər											■
		■									
							■	■			

Muncuqlar və qalın ip





62- İpə reaksiya verər

63-İpə muncuq düzər (1)

64- İpdəki muncuğu yelləyər

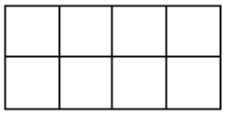
65- Muncuqları taxda çubuqlardan çıxardar (6)

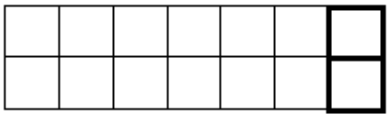
66- Taxda çubuqlardan kubik muncuqları keçirər (3)

67- Hər iki əlini istifadə edər

68- Bir əindəki əşyanı diyər əlinə verər

Adlandırma

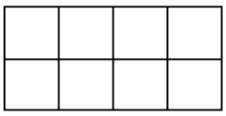


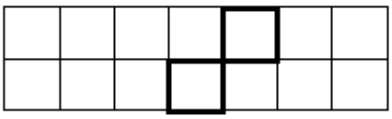


69- Sənin adın nədir?

70- Sən qızsan yoxsa oğlan?

Yazmaq





71-Öz-özünə qaralama edər

72- Eyni əlini davamlı halda istifadə edər

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PEP-R Qiymət Cədvəli 5 **Davranış** **İnkişaf**

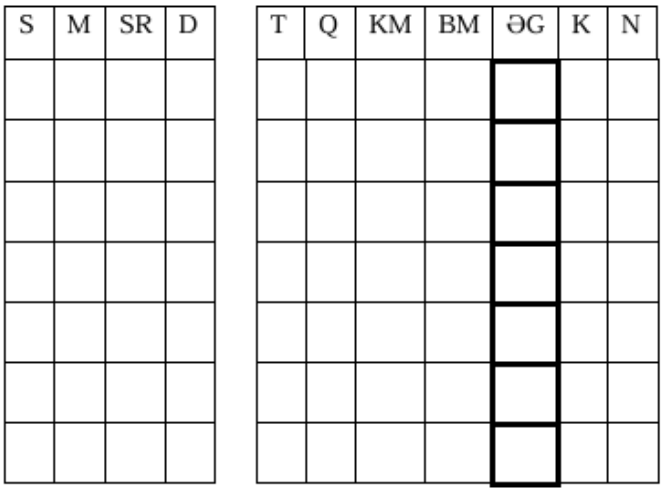
73 – Modelə baxaraq dik xətt çəkər (3'dən biri) (71 = -işə bal-)

74 – Modelə baxaraq dairə çəkər (3-dən biri) (71 = -işə bal-)

75 – Modelə baxaraq kvadrat çəkər (3-dən biri) (73= -işə bal)

76 – Modelə baxaraq üçbucaq çəkər (3-dən biri) (73= -işə bal)

77 – Modelə baxaraq paxlava çəkər (3-dən biri) (73= -işə bal)



78 – Sərhədlərə diqqət edərək kənara çıxmadan rəngləyər (71 = -işə bal-)

79 – Şəkillərin üstündən keçər (74 -77= + ya da işə bal)

Əlifba kartları

80 – Hərfləri eyniləşdirər(9)

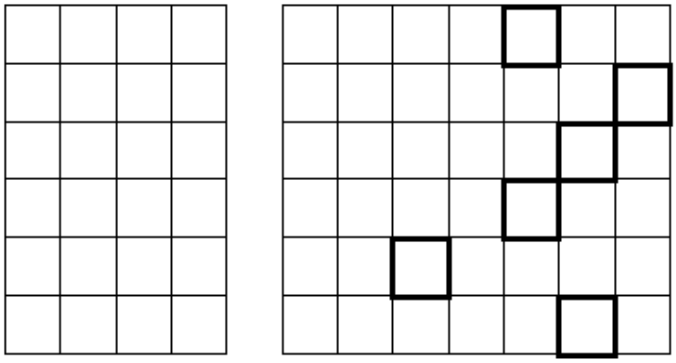
81 – Hərfləri adlandırar (9)

82 – Deyiləndə hərfləri göstərər(9)

83 – Modelə baxaraq hərfləri yazar (7) (73= - işə bal -)

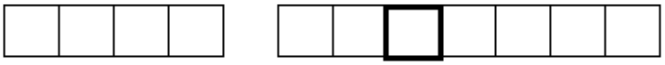
84 – Bir adam çəkər (73 = -işə bal)

85 – Adını yazar (83 = -işə bal-)



Qayçı və kağız

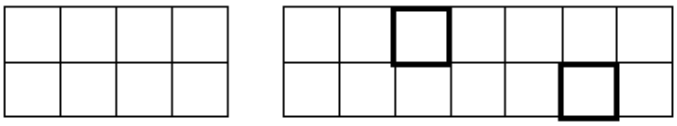
86 – Qayçıyla kağızı kəsər



Əşya və bir torba

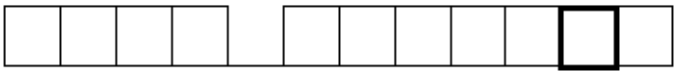
87 – Əşyaları tanıyar və onları verər (4)

88 – Əşyaları toxunaraq tanıyar (4)



Keçə taxtası və parçaları

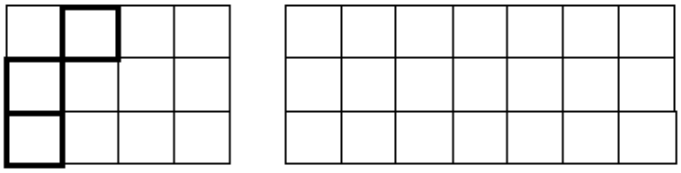
89 – Keçə parçalarından uşaq düzəldər



Plansız oyun

90 – Tək oynayar (U/O/A)

91 – Sosial münasibətə başlayar (U/O/A)



92 –Müəllimin səsinə münasibət göstərir

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PEP-R Qiymət Cədvəli6 **Davranış** **İnkişaf**

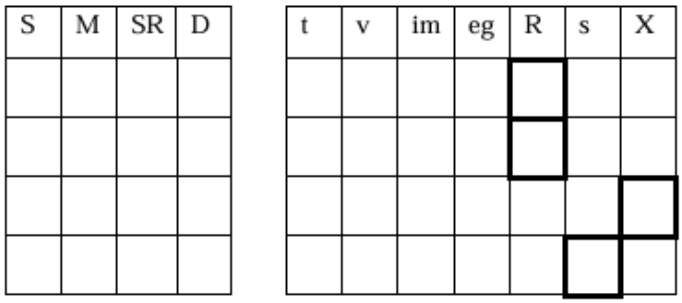
Kiçik kublar və qutular

93-Kubları üst-üstə qoyar.(8)

94-Kubları qutuya qoyar

95-2 və 7 kub sayar.

96-2 və 6 kubu göstərər.



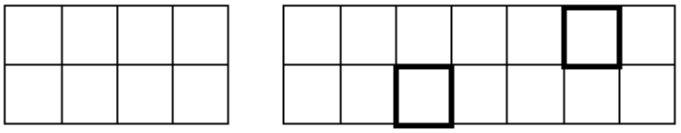
Stəkanvəkublar

97- iki pilləli tapşırığı yerinə yetirər.

Kublar,Muncuqlar,Banka

98-İkili siniflәndirmə (6) (94 =- isə bal -)

99-Qutuya kub atma (98=+ya da ± isə bal +)

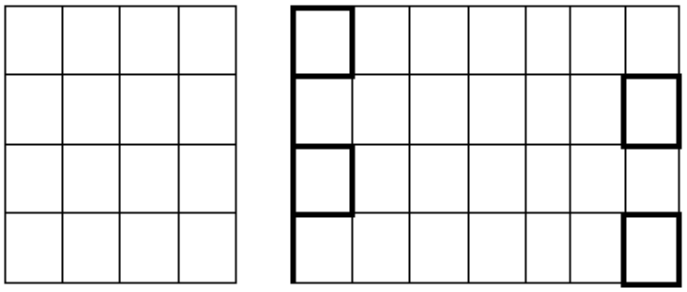


Rəqəm təqlidi

100-2 və ya 3 rəqəmi təkrar edər.

101-2 ya da 3 rəqəmi təkrar edər Birinci yoxlama:7-8,2-4-1/İkinci yoxlama 5-3,5-7-9

102-4 ya da 5 rəqəmi təkrar edər.(Əgər 100= - isə bal -)

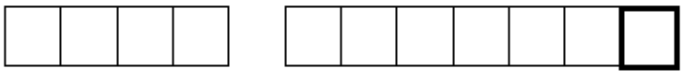


103-4 ya da 5 rəqəqmi təkrar edər.

Birinci yoxlama:5-8-6-1,3-2-9-4-8/ Ikinci yoxlama:7-1-4-2,7-4-8-3-1

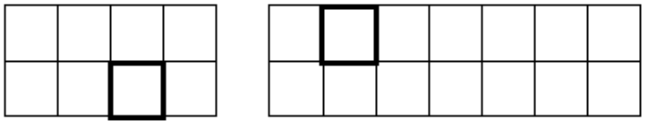
Əzbər sayma

104-Yüksək səslə sayar.(1-dən 10-a qədər)



Zəng

111-Zəngin səsini eşidər və ona doğru yönələr



112-Zəngin səsinə reaksiya verər.(U/O/A)

Zəng,Zınqırov,Qaşıq

113-Səs çıxaran əşyalarla hərəkəti təqlid edər.(3)

Sinifləndirmə kartları

114- Kartları rəng və formasına görə sinifləndirir.(12) (32=- ya da ± isə bal -)

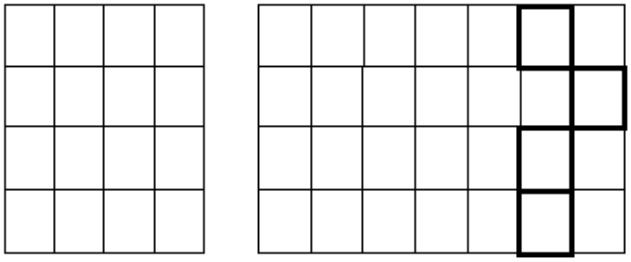
Kartlar və əşyaları eyniləşdirmə

115-Əşyaları rəsimləri ilə eyniləşdirir.

116-Əşyaları adlandırır.(5)

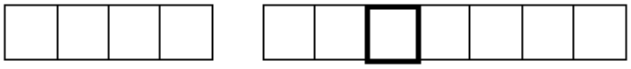
117-İstədikdə əşyaları verir.(3)

118-Əşyaların funksiyalarını göstərir.(4)



İşığı yandırıb söndürmə

119-İşığı yandırıb söndürür.

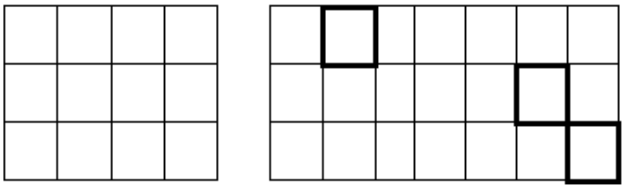


Kitab

120-Kitaba maraq göstərir.

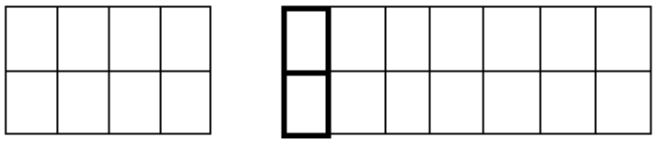
121-Söylədikdə rəsimləri göstərir.(14)

122-Rəsimlərin adlarını deyir.



Səsləri, Sözləri ,Cümlələri Təkrar Edər.

123-Səsləri təkrar edər.(3) (mmm,ba-ba,pa-ta,la-la)



124-Sözləri təkrar edər.(2) (gəl, uşaq, top)

#	0	0	1	0
U				
O				
A				

#	3	3	2	0	0	6	2
(+)							
(±)							
(-)							

PEP-R Qiymət Cədvəli 8 **Davranış** **İnkişaf**

Səsləri,Sözləri və Cümlələri Təkrar Edər (Davamı)

125- Qısa cümlələri ya da ifadələri təkrar edər.(2)(Əgər 124 =- isə bal -) (əgər

126- Asan cümlələri təkrar edər.(2)(Əgər 125=-ya da ± isə bal -)

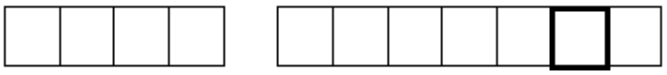
S	M	SR	D

T	A	İM	KM	EG	B	S

127-Qarışıq cümlələri təkrar edər(2)(Əgər 126 =-ya da ± isə bal-)

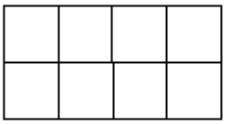
Qutu,Kukla,Stəkan,Stol,Top

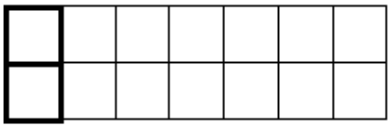
128-Sözlü təlimatlara cavab verir.(4)



Təqlid

129-Öz hərəkətlərinin təqlidinə reaksiya verir.(41=+ isə bal+)

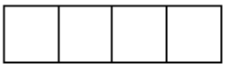




130-Öz çıxardığı səslərin təqlidinə reaksiya verir (124=+ isə bal +)

Əmrlər

131- Sadə təlimatlara uyar.(3)



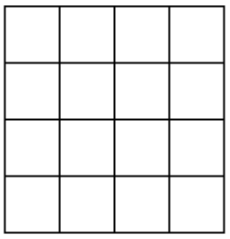
Uşağın Dili İstifadə etməsi

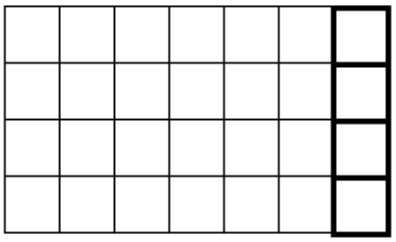
132-2 sözlü ifadələri istifadə edər.(3)

133- 4 ya da 5 sözlü ifadəəri istifadə edər.(1)

134-Cəm şəkilçilərini istifadə edər

135-Şəxs əvəzliklərini istifadə edər.



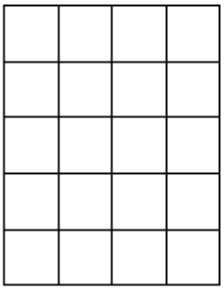


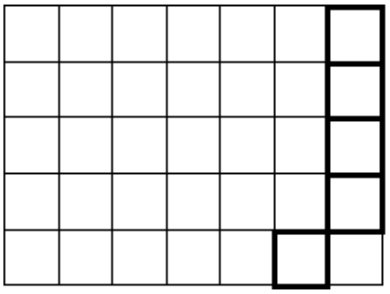
Kitab

136-Qısa sözləri oxuyar.(3)

137-Qısa cümlələri oxuyar(1)(Əgər 136=-ya da ±isə bal -)

138-Bir neçə səhv edərək oxuyar.(137=-ya da± isə bal -)



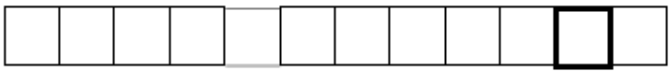


139- Anlayaraq oxuyar.(137=-ya da± isə bal -)

140-Təlimatları oxuyar və təqib edər(137=-ya da ±isə bal -)

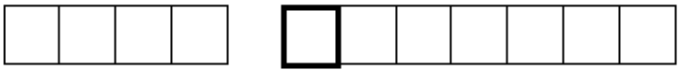
Qurtardı qutusu

141-Rutinləri (gedişatı)istifadə edər



Vədalaşır

142-Əli ilə "bay-bay" edər.(41=+isə bal+)



Çimdik

143-Çimdikləməyə reaksiya verir(U/O/A)

#	0	0	1	0	#	3	0	0	0	0	4	11
U					(+)							
O					(±)							
A					(-)							

Appendix 2

PORTEC (nitq bacarıqlarını dəyərləndirmə)

0-1 (1-15)

1-2 (16-45)

2-3 (46-81)

3-4 (82-99)

4-5 (100-110)

5-6 (111-124)

Nəticə hesablanması:

(ÜSS)

“ + “

“ +/- “

“ _ “

Kart	**Bacarıq**	**Qeyd**	**Əlavələr**
0.	Digərlərinin çıxardığı səsi özünəməxsus şəkildə yamsılayar.		
2.	Təqlid etməklə eyni hecaları 2 və y 3 dəfə təkrar edir (məs, ma, ma).		
3.	Jestlərə jestlərlə cavab verir.		
4.	Musiqi eşidəndə səslər çıxarır.		
5.	Danışan insanlara baxarkən söhbəti izləyir.		
6.	Jestlər ilə müşayiət olunan sadə göstərişləri yerinə yetirir.		
7.	Uşağa yox deyəndə 75% hallarda fəaliyyəti dayandırır.		
8.	Tanış əşyaları adlandıranda onlara baxır		
9.	Sadə suallara hərəkət ilə cavab verir. Məs,. Top hardadı?		
10.	Oyun zamanı səslər çıxarır.		
11.	Bir neçə saniyə şəkillərə baxır.		
12.	Digər insanların səs intonasiyalarını təqlid edir.		
13.	Əşyaları və insanları adlandırır.		
14.	Səslər çıxarmaqla digərlərinin söhbətinə qatılır.		
15.	Sadə şeirlərə və mahnılara reaksiya verir.		
16.	5 müxtəlif söz söyləyir (bir neçə əşyanı bir sözlə adlandıra bilər).		
17.	Gizlədilmiş səs mənbəyini axtarı (məs, qutuda gizlədilmiş zəng , yastığın altında gizlədilmiş saat və.s).		
18.	Daha çox istəyini göstərmək üçün işarələrədən istifadə edir.		

19.	Sadə əşyalardan (fincan, qaşıq, daraq) istifadə edilməsini imitasiya edir.		
20.	Hamısı qurtardı anlayışını başa düşür.		
21.	Bayırda olan səs mənbəyini axtarır.		
22.	Müxtəlif heyvan səsləri çıxarır.		
23.	1 mərhələdən ibarət olan 3 müxtəlif göstərişi başa düşür.		
24.	Adlandırılmış 6 əşyaya baxır ya da onları göstərir.		
25.	Kitabda adları 3 şəkli göstərir.		
26.	Öz üzərində üç bədən üzvünü göstərir.		
27.	10 söz bilir.		
28.	Öz adını və ləqəbini bilir.		
29.	Tanış əşyanı göstərib “bu nədir?” soruşduqda sualı cavablandırır.		
30.	“Yenə də “ deyərək istəyir.		
31.	Deyir “qurtardı” yaxud “hamısı qurtardı”.		
32.	Həvəsləndirəndə “mənə ver” yaxud “mənə göstər” tapşırıqlarına əməl etməyi bacarır.		
33.	Bədənin münasib hərəkətləri ilə yuxarı və aşağı göstərərək əməl edir.		
34.	Istədiyini bildirmək üçün sözlərdən və işarələrdən birlikdə istifadə edir.		
35.	Tanış vəziyyətlərdə (həyətə getmək, yemək vaxtı, yatmaq vaxtı) nə etmək lazım olduğunu bilir.		
36.	6 ailə üzvünün adını təxəllüsləri ilə daxil olmaqla deyir.		
37.	Adların çəkilən 12 tanış əşyanı barmağı ilə göstərir.		
38.	Oyun zamanı böyüklərin danışığına cavab olaraq səslər çıxarır.		
39.	4 oyuncağı adlandırır.		
40.	Göstərildikdə bəzi sadə qida məmulatlarının adlarını deməklə istəyir.		
41.	Gəlincikdə və yaxud başqa insanda 3 bədən üzvünü adlandırır.		
42.	Sonuncu sözdə intonasiyanı artırmaqla suallar verir.		
43.	Cavabı hə-yox olan sualları təsdiq yaxud inkar formasında cavab verir.		
44.	Gündəlik istifadə olunan ümumi obyektləri adlandırır (məsələn, park, bağ, mağaza).		
45.	Hərəkət bildirən sözlərə cavab olaraq hərəkət edir.		
46.	Sadə sifətləri başa düşür (məsələn, yorğun, xoşbəxt soyuq, böyük, balaca).		
47.	Oyunun ardıcılığının təqlid edir.		
48.	Sadə sifətlərdən istifadə edir.		
49.	Sadə fəaliyyətlərə aid sualları cavab verir.		
50.	2 sözü ismi isimlə və ismi sifətlə birləşdirir.		
51.	Fel ilə tamamlığı birləşdirir(məsələn çayı iç, yemək hazırla, maşını sür).		
52.	Isimlə feyli birləşdirir (məsələn, ata gəlir).		
53.	Ayaq yoluna getmək istəyini bildirmək üçün xüsusi		

	sözdən istifadə edir.		
54.	İsim və ya feili burada-orada sözləri ilə 2 söz cümlədə birləşdirir.		
55.	Məxsusluğunu ifadə etmək üçün 2 sözü birləşdirir (məsələn ata, maşın atanın maşını).		
56.	Şəkillərdə olan detalları diqqət yetirir.		
57.	Şifahi dəstəklə təsəvvür edici oyuna qoşulur.		
58.	Şifahi təsvirə əsasən sadə əşyanı istifadəsinə uyğun seçir.		
59.	"Haradadır?" sualına cavab verir.		
60.	Ətrafdakı tanış səsləri adlandırır.		
61.	İsmi feyli ve sifəti birləşdirir (məsələn, atanın böyük maşını, ata işə gedir).		
62.	"Kim istəyir?" sualının cavabında öz adını deyir.		
63.	Adi əşyaların nə üçün istifadə edilməsini deyir.		
64.	Sadə hekayəyə qulaq asır (məsələn, yatmağa hazırlaşanda).		
65.	Barmaqlarla yaşını göstərir..		
66.	Soruşan zaman öz cinsini bilir		
67.	Biri-biri ilə əlaqəli hissədən ibarət göstərişi yerinə yetirir.		
68.	Təsəvvür edici oyun zamanı böyük ilə danışır.		
69.	Televiziya proqramlarında olan insanları və ya qəhrəmanları izləyir və adlandırır.		
70.	İsimlərin can formasından istifadə edir (məsələn, kitab/kitablar).		
71.	Mürəkkəb şəkilləri təsvir edir.		
72.	"Bu nədir?"sualını verir.		
73.	90 faiz hallarda səsin tonunu idarə edir.		
74.	Danışarkən bu və o sözlərdən istifadə edir..		
75.	Mən, məni, mənə, mənim sözlərindən istifadə edir (öz adının əvəzinə).		
76.	İstəməməsini və ya etirazını bildirmək üçün yox və ya yoxdu sözlərindən istifadə edir.		
77.	Kimdir? sualına cavab olaraq fəaliyyəti icra edən şəxsin adını çəkir.		
78.	Məxsusluğunu göstərmək üçün" kimindir?" sualını düzgün cavablandırır.		
79.	Bəzi əşya qruplarını adlandırır(məsələn, oyuncaqlar, heyvanlar, ərzaqlar və. s)..		
80.	Sadə ritmik hərəkətləri yamsılayır.		
81.	4 və daha artıq sözdən ibarət cümlə qurar.		
82.	Musiqili oyunlar zamanı uca və sakit səsləri müəyyənləşdirir.		
83..	Sadə diaqloqlarda iştirak edir.		
84.	"Harada? "və "kim?"sözləri ilə başlayan suallar verir.		
85.	Hekayəyə 5 dəqiqə ərzində qulaq asır.		
86.	" İçinə""bayıra- xaricinə""arxasına"" üstünə" anlayışlarını bilir.		
87.	" Niyə? " sualı verir və böyüklərin cavabına qulaq		

	asır.		
88.	2 biri-birindən asılı olmayan göstərişləri yerinə yetirir.		
89.	Öz adını və soyadını deyir..		
90.	“ Necə“ ilə başlayan suallara cavab verir.		
91.	Tanış əşyaların ölçüsünə aid olan sifərlərdən istifadə edir.		
92.	Təsəvvüredici oyunlarda müəyyən rollar oynayır.		
93.	Oyun zaman fəaliyyətlərin ardıcıllığını danışa-danışa planlaşdırır.		
94.	Təzəcə qazandığı təcrübə barədə danışır.		
95.	Sadə hekayələrdə baş verən hadisələr barəsində “Niyə? “ suallarına cavab verir.		
96.	Sadə əşyalardan necə istifadə edildiyi barəsində danışır.		
97.	2 ardıcıl hadisə barəsində onların baş verdiyi ardıcıllığa uyğun danışır.		
98.	Uşağın nitqi yad insanlar üçün başadüşüləndir.		
99.	3 mərhələdən ibarət olan tapşırıqları yerinə yetirir.		
100.	Əşyalar və şəkillər arasında eynisini tapır.		
101.	Mürəkkəb cümlələrdən istifadə edir (mən topu vurdum və ağaca dəydi).		
102.	Əşyanın yuxarı və aşağı hissəsini tapır.		
103.	Şəkildə uyğun olmayan hissəni tapır.		
104.	“Bacı““qardaş““ nənə““baba“ sözlərindən istifadə edir.		
105.	Sözlərin və ya anlayışların əksini söyləyir..		
106.	Tanış hekayəni köməkçi şəkillərdən istifadə etmədən söyləyir.		
107.	Hər hansı bir qrupa aid olmayan şəkili adalandırır.		
108.	Mürrəkkəb tabeli cümlələr işlədir.		
109.	Uca və sakit səsləri müəyyənləşdirir.		
110.	“Bir az““bir çox““bir neçə dənə“ anlayışlarını bilir.		
111.	Ünvanını söyləyir.		
112.	Telefon nömrəsini söyləyir.		
113.	“Ən çox“ və “ ən az“ göstərə bilir.		
114.	Adi zarafatlardan istifadə edir.		
115.	Gündəlik təcrübəsi haqqında danışa bilir.		
116.	Olduğu məkan və hərəkəti “ yanında“ “altında“ “üstündə“ “qarşısında“ “arxasında“ sözlərindənistifadə edərək izah edir.		
117.	“Nə üçün? “ sualını geniş cavablandırır`.		
118.	Hadisələri 3-5 hissəyə ayırıb uyğun ardıcıllıqla danışır.		
119.	Sözün mənasını müəyyənləşdirir.		
120.	Verilmiş sözün əksini söyləyə bilir.		
121.	“Yumurta əlindən düşsə nə olar? “ Kimi suallar; cavablandırır.		
122.	“ Dünən“ və “ bu gün“ anlayışlarından istifadə edir.		
123.	Yeni və qeyri-adi sözlərin mənasını soruşur.		

Appendix 3

Lamiya Muzaffarli

The relationship of the development of speech and motor skills of children with autism in the period of early development

ABSTRACT

This dissertation explores the interrelation between speech development and motor skills—both fine and gross—in young children diagnosed with Autism Spectrum Disorder (ASD). Rooted in developmental psychology and neurodevelopmental frameworks, the study recognizes that the early years of a child's life represent a critical window for both communicative and motoric maturation. Autism, as defined by the DSM-5 and ICD-11, is characterized by persistent difficulties in social communication and restricted, repetitive patterns of behavior, often accompanied by delays or atypicalities in motor and language development. The interplay between these domains remains a growing area of interest in both research and clinical practice, particularly with respect to early developmental interventions.

The theoretical framework is informed by Lev Vygotsky's sociocultural theory, emphasizing the role of language as a mediator of cognitive development and the significance of the Zone of Proximal Development (ZPD) in scaffolding learning. This perspective underlines the importance of assessing and supporting both motor and linguistic capacities in children with ASD, who may struggle to integrate sensory, motor, and communicative input during early development.

The empirical study was conducted at the NEFES Psychoneurological Center in Azerbaijan and included a purposive sample of 60 children with clinically confirmed ASD diagnoses, ranging in age from 22 to 80 months. A mixed-method assessment strategy was employed, combining standardized developmental tools such as the Psychoeducational Profile – Revised (PEP-R) and the Portage Guide to Early Education to evaluate the levels of speech development, fine motor coordination (e.g., object manipulation, hand-eye coordination), and gross motor function (e.g., balance, locomotion).

Data were analyzed using SPSS 16.0. Due to non-normal distribution patterns (confirmed by Q-Q plots and histograms), non-parametric statistical methods—primarily Spearman's rank-order correlation coefficient (rho)—were applied to examine associations among variables. The results revealed statistically significant positive correlations between speech development and both fine motor skills ($\rho = .497$, $p < .001$) and gross motor skills ($\rho = .319$, $p < .05$). These findings suggest that motor proficiency, particularly in fine motor

domains, may play a facilitative role in the progression of communicative abilities among children with ASD.

The dissertation contributes to the growing body of research emphasizing the need for integrated, multidisciplinary approaches in the early support of children on the autism spectrum. The results advocate for early developmental screening programs that consider both language and motor domains and highlight the potential benefits of interventions that concurrently target motor planning and speech-language processing. Furthermore, the findings offer practical guidance for educators, clinicians, and caregivers in tailoring support strategies to the holistic developmental profile of each child.

Keywords: Autism Spectrum Disorder, early childhood development, speech skills, fine motor skills, gross motor skills, Psychoeducational Profile-Revised (PEP-R), Portage Guide, , interdisciplinary intervention.

Appendix 4

Lamiyə Müzəffərli

Autizmli uşaqlarin erkən inkişaf dövründə nitq və motor bacariqlarinin inkişafinin əlaqəsi

XÜLASƏ

Bu dissertasiya Erkən Uşaq İnkişafı dövründə Autizm Spektr Pozuntusu (ASP) diaqnozu qoyulmuş uşaqlarda nitqin inkişafı ilə motor bacarıqlar (həm incə, həm də ümumi motor bacarıqlar) arasındakı qarşılıqlı əlaqəni araşdırır. Tədqiqat inkişaf psixologiyası və neyroinkişaf nəzəriyyələri kontekstində aparılmış və uşaqlıq dövrünün həm kommunikativ, həm də motor inkişaf üçün həlledici bir mərhələ olduğunu nəzərə alır. DSM-5 və ICD-11 təsnifatlarına əsasən autizm, sosial kommunikasiya sahəsində davamlı çətinliklər və təkrarlanan davranışlarla xarakterizə olunur. Bu pozuntular tez-tez nitq və motor inkişafda gecikmələr və ya atipikliklərlə müşayiət olunur. Nitq və motor bacarıqları arasındakı qarşılıqlı təsir son dövrlərdə həm elmi tədqiqat, həm də klinik praktikada artan maraq doğuran mövzulardandır.

Tədqiqatın nəzəri bazası Lev Vıqotskinin sosiomədəni nəzəriyyəsinə əsaslanır. Bu nəzəriyyə dilin idrak inkişafında vasitəçi rolunu və Proksimal İnkişaf Zonası (PİZ) çərçivəsində öyrənmənin sosial yönünü vurğulayır. Bu baxımdan, autizmli uşaqlarda həm motor, həm də nitq bacarıqlarının qiymətləndirilməsi və dəstəklənməsi erkən inkişafın effektiv şəkildə yönləndirilməsi üçün xüsusi əhəmiyyət daşıyır.

Empirik tədqiqat Azərbaycan Respublikasında fəaliyyət göstərən NEFES Psixonevroloji Mərkəzində aparılmışdır. Tədqiqatda 22–80 ay arası, ASP diaqnozu almış 60 uşaq iştirak etmişdir. Uşaqların nitq bacarıqları, incə motor (məsələn, əllə manipulyasiya, əl-göz koordinasiyası) və ümumi motor bacarıqları (məsələn, balans, yerimə) Psychoeducational Profile – Revised (PEP-R) və Portage Erkən Təhsil Bələdçisi vasitəsilə qiymətləndirilmişdir.

Statistik analizlər SPSS 16.0 proqramı ilə aparılmışdır. Q-Q qrafikləri və histogramlar vasitəsilə verilənlərin normal bölgüyə uyğun olmadığı müəyyən edildiyindən, Spearman rho kimi parametrik olmayan üsullardan istifadə edilmişdir. Nəticələr göstərdi ki, nitqin inkişafı ilə incə motor bacarıqlar arasında ($\rho = .497$, $p < .001$) və ümumi motor bacarıqlar arasında ($\rho = .319$, $p < .05$) əhəmiyyətli dərəcədə pozitiv korrelyasiya mövcuddur. Bu isə motor bacarıqların, xüsusilə incə motor sahəsindəki inkişafın, autizmli uşaqlarda nitqin formalaşmasına təsir göstərə biləcəyini ortaya qoyur.

Dissertasiya ASP-li uşaqlarda inkişafın hərtərəfli qiymətləndirilməsinin və multidissiplinar dəstəyin vacibliyinə dair elmi ədəbiyyata töhfə verir. Nəticələr motor və dil sahələrini birgə nəzərə alan erkən müdaxilə proqramlarının əhəmiyyətini vurğulayır və

praktik baxımdan müəllimlər, klinik mütəxəssislər və valideynlər üçün individual dəstək strategiyalarının hazırlanmasında rəhbər ola bilər.

Açar sözlər: Autizm Spektr Pozuntusu, erkən uşaq inkişafı, nitq bacarıqları, incə motor bacarıqlar, böyük motor bacarıqlar, Psixopedaqoji Profil (PEP-R), Portage Erkən Təhsil Bələdçisi, multidissiplinar müdaxilə