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Joint Attention Deficits as a Key Indicator in the Early Diagnosis of Autism Spectrum Disorder: An Analytical Study in Light of Previous Research

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Abstract:

The present study focuses on the issue of joint attention deficits and the importance of diagnosing it at an early stage of a child's development in order to detect autism spectrum disorder (ASD). Joint attention is considered one of the essential pre-linguistic skills necessary for the acquisition of subsequent language abilities. Children with typical development acquire these skills naturally, such as maintaining eye contact, exchanging and following gazes, staring, and using gestures. In contrast, children with autism often show deficits in these abilities, which affects their linguistic, cognitive, and social development. Recent studies have emphasized that early diagnosis of joint attention deficits can contribute to the early detection of autism, thereby facilitating effective therapeutic interventions that improve the quality of life for these children. Accordingly, this study aims to highlight the importance of joint attention as a key indicator in the early diagnosis of autism spectrum disorder.

Keywords: Autism spectrum disorder, Joint attention, Language, Eye contact, Gazes, Gestures.

Introduction

Autism spectrum disorder (ASD) is considered one of the most complex and puzzling developmental disorders that affect children at an early age. It is characterized by a set of behavioral manifestations that hinder normal development and negatively impact the child, their parents, and family members.

Autism is one of the disabilities that impair the brain's ability to process and interpret information, leading to difficulties in how the child communicates with others and acquires behavioral and social learning skills. Autism typically appears within the first three years of life and persists throughout the individual's lifetime (Al-Adl, 2013, p. 149).

According to the revised Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, 2022), autism spectrum disorder is defined by two core areas of impairment: persistent deficits in reciprocal social communication and interaction, and restricted, repetitive patterns of behavior, interests, or activities. These symptoms emerge in early childhood and significantly impair daily functioning. The onset and visibility of symptoms vary depending on the individual's characteristics and environment. Although intervention, compensation, and current support may mask some difficulties, the symptoms differ depending on the severity of the disorder, developmental level, and chronological age (Abdel-Aal Mohamed et al., 2023, p. 864).

Children with autism also exhibit deficits in non-verbal communication skills, known as joint attention skills, which include eye contact, imitation, listening and understanding, pointing to desired objects, and recognizing and interpreting facial expressions and vocal tones (Ben Sidiq, 2007, p. 10).

Joint attention represents a crucial developmental skill, where two individuals share focus on the same object or event. It involves behaviors such as looking at where another person is looking or pointing. What distinguishes joint attention is that the child is not merely interested in objects themselves but in the other person's focus and direction toward the object. This developmental feature provides children with multiple learning opportunities. When a child looks at the same object as another person, they are not only sharing interest but also acquiring information about the other person's emotions (Al-Zureikat, 2004, p. 41).

Joint attention plays a central role in language, social, and cognitive development. Its deficiency is considered a core feature of autism spectrum disorder. In what follows, we will explore joint attention skills in children with autism and identify the most significant indicators related to these deficits.

Problem Statement:

Joint attention is often referred to as *triadic interaction*, due to the presence of three essential components: the adult, the child, and an external object. This ability to focus attention on a shared point of interest forms the foundation for the development of language and other cognitive skills. A lack of joint attention skills is considered one of the most

distinguishing characteristics between children with autism spectrum disorder (ASD) and their typically developing peers. Research indicates that between 90% and 94% of children with autism exhibit deficits in joint attention, making it a significant diagnostic indicator. The remaining 6% to 10%, who do engage in joint attention, tend to do so in a manner that differs from that of neurotypical children and often show reduced expression of positive emotional affect (Abdel-Hafiz, 2018, p. 63).

Joint attention refers to the ability to coordinate attention in order to share a reference point with another person. It emerges early in development and is a clear indicator of the capacity to understand others' representations. It is essential for the development of symbolic thinking and language acquisition. Deficits in early prelinguistic communication skills are strong predictors of the risk of developing autism spectrum disorder (Montagut-Asunción, Crespo-Martín, Pastor-Cerezuela, & D'Ocon-Giménez, 2022, p. 1).

Deficits in joint attention typically manifest as difficulties in: orienting and attending to a social partner, alternating gaze between a communication partner and an object or event, sharing affect or emotional states with others, following gaze shifts or gestures made by others, and initiating joint attention by directing someone else's attention to a shared point of interest (e.g., an object or event) (Al-Thaqafi, 2014, p. 45).

Some of the common indicators of impaired joint attention in children with autism include: failure to look at what others are pointing to, difficulty maintaining eye contact, reduced ability to point at objects, lack of response when their name is called, inability to follow others' head movements, and a general lack of ability to draw others' attention to surrounding objects, topics, or events. These children also struggle to share interests or activities with others and tend to use pointing gestures solely to request something, rather than to share an experience. Additionally, they lack spontaneous attempts to engage others in shared interests (Al-Zubaidi, 2022, p. 55).

Researcher Amira Ahmed Ismail Ali (2017) asserts that children with autism do not acquire joint attention skills automatically, unlike their typically developing peers. Neurotypical children learn essential communication and social interaction skills naturally, as their brains are neurologically equipped to do so. They intuitively pick up these skills and refine them through interaction with adults. In contrast, children with autism lack the appropriate neurological mechanisms that allow for such natural learning. Therefore, they must acquire these skills intentionally and through direct instruction within educational programs specifically designed to target them. The researcher adds that direct teaching of joint attention and nonverbal social behaviors may induce neurological changes in the child's brain—especially during the early years of life (Ismail Ali, 2017, p. 14).

Children with autism spectrum disorder (ASD) face difficulties in using joint attention skills in a coordinated and spontaneous manner during everyday situations. Furthermore, the sequence of acquiring joint attention appears to differ from that observed in typically developing children. When engaging in interactions with others, children with autism demonstrate deficits in joint attention, which is a hallmark feature of ASD. They rarely point to or show objects to others, and they also struggle with using eye contact to attract an adult's attention and then redirecting it (Ali, Shahin, & Al-Buheiri, 2022, p. 39).

Many studies have explored the topic of joint attention and social performance in individuals with autism, addressing various aspects such as: eye contact, gaze following, gaze fixation on eyes and mouth. Despite the extensive research into factors associated with social performance in individuals with autism, emphasis on the role of primary sensory input—particularly visual processing—has only recently emerged. Widespread deficits in gaze patterns have been reported in individuals with autism, ranging from basic saccadic eye movement functions to social attention and the processing of complex biological motion. Since social functioning often depends on the accurate processing of visual information, inefficient visual processing may contribute to the emergence and persistence of social difficulties in individuals with autism (Riddiford, Enticott, Lavale, & Gurvich, 2022).

In this context, and in an effort to detect whether deficits in joint attention skills are present, many studies—within our scope of review—have examined behaviors related to social orientation and initiation of joint attention. Among them is the study conducted by Palomo, Ozonoff, Young, and Belinchon Carmona (2022), whose findings indicated that infants with autism between 9 and 12 months of age exhibited impairments in responding to their names, using gestures, exchanging gaze, and initiating joint attention.

Another study aimed at comparing eye-tracking performance in response to joint attention in both neurotypical individuals and those with autism spectrum disorder, conducted by Ryan Anthony de Belen, Hannah Pincham, Natalie Silove, Arcot Sowmya, and Valsamma Eapen (2023), presented a series of studies conducted across various age groups, from infants to adolescents. The results demonstrated a deficit in eye gaze tracking and gaze fixation in individuals, particularly towards social scenes or faces. For example, a study by Chawaska (2013) found that infants at 6 months showed a brief gaze fixation towards faces or social scenes. In another study by Bedford (2012), individuals spent less time looking at targets. Chawaska's study (2012) also indicated that children aged 13–25 months spent less time looking at faces.

Similarly, Vivanti (2017) found that 48-month-old children experienced deficits in gaze tracking and spent less time looking at scenes or faces. Other studies, such as Gillespie-Lynch (2013) and Ryan Anthony de Belen (2023), also observed that children in different age ranges (28–80 months and 31–73 months, respectively) exhibited deficits in gaze following or showed less interest in it. In Congiu's study (2016), children aged 45–103 months showed less accuracy in

gaze tracking and spent less time looking at objects. On the other hand, Swanson and Siller (2013) noted that 84-month-old children took longer to fixate on the first stimulus. Finally, a study by Griffin and Scherf (2020) showed that adolescents (10–18 years) had difficulties in gaze-following skills to identify gaze on objects.

Overall, the studies indicate that individuals across different age groups experience deficits in gaze following and fixation, with a reduction in time spent looking at social targets (such as faces) or objects. These difficulties are most evident in early childhood and persist through adolescence (de Belen, Pincham, Hodge, Silove, Sowmya, Bednarz, & Eapen, 2023).

To analyze the relationship between gaze patterns (such as eye gaze positions while watching videos) and social performance in autism spectrum disorder, Riddiford, Enticott, Lavale, and Gurvich (2022) reviewed 95 studies, and the results revealed a correlation between increased gaze towards the face/head and eye regions with improved social performance and decreased autism symptoms. However, gaze patterns towards the mouth were found to be dependent on the social and emotional content of the scenes as well as the cognitive profile of the participants. Additionally, individual factors such as intelligence levels and the complexity of social scenes had an impact on gaze patterns. Therefore, the study recommends future research that includes large-scale longitudinal studies in this field.

Through a review and analysis of eye-tracking studies on children with autism spectrum disorder, studies of eye movements in children with autism revealed a reduced fixation duration on the eyes and no specific fixation of eye gaze on the eyes and/or mouth compared to neurotypical children. Researchers reviewed twenty eye-tracking studies on children with autism spectrum disorder, and the results showed that these children had a significant reduction in gaze fixation in the eye region of faces. The findings indicate that individuals with autism have considerable difficulty in fixating their gaze on the eyes. On the other hand, no significant differences were found in fixation on the mouth region (Papagiannopoulou, Chitty, Hermens, Hickie, & Lagopoulos, 2014).

Another hypothesis suggests that individuals with autism show excessive focus on the mouth and less gaze on the eyes compared to neurotypical individuals, but this hypothesis remains limited and requires further evidence (Guillon, Hadjikhani, Baduel, & Rogé, 2014).

In another context, treatments targeting joint attention have shown significant effectiveness, despite the considerable methodological challenges in functional imaging of brain regions that support social behaviors during the first two years of a child's life. Functional magnetic resonance imaging (fMRI) and behavioral assessments of infants and toddlers reveal that the functional organization of the brain is closely associated with the emergence of joint attention (Abdullah, Mohamed Ibrahim, 2023, p. 347).

As mentioned earlier, the following questions can be raised: What is meant by joint attention and what is its significance in the early diagnosis of autism spectrum disorder?

1. **Concept of Joint Attention**: Below are the key definitions of joint attention discussed by some researchers:

According to Bruner (1983), joint attention is a set of verbal and non-verbal social communication skills such as gestures, eye contact, facial expressions, reciprocal signaling, and the expression and understanding of emotions, which allow the child to share an experience of something or an event with another person (Ismail Ali, 2018, p. 7).

According to Hana Shahat Ahmed Abdel-Hafez, joint attention is a social exchange in which children and adults focus on the same event or object. For the child to do so, they use a set of skills such as eye gaze, signaling, gestures, and producing sounds or words. The child establishes a shared reference point between themselves and the surrounding adults in various ways, including verbal and non-verbal communication (2018, p. 63).

As stated by Winoto & Tang (2019), joint attention is the ability to share experiences and interests about things and events with others in a social environment. Due to the deficit in joint attention in children with autism spectrum disorder, they usually face challenges in communication, such as reluctance to engage in social communication and share things with others (Jaber, 2022, p. 38).

Adel Abdullah Mahmoud (2020) defines joint attention as a social interaction and exchange that involves the coordination of attention between one person and another around something, using a set of skills such as eye contact, signaling, gestures, facial expressions, and head turning. Joint attention, therefore, is a triadic process involving the child, an adult or caregiver, and the event or object of attention using communicative skills and methods (Abd Alal Mohamed, Ibrahim Sayad , Ajwa, & Qarni, 2023, p. 857).

Joint attention, therefore, refers to the ability to shift attention between an object and a person through the use of skills such as coordination and alignment of gaze between things and people, signaling, and skills for displaying and showing objects.

2. Types of Joint Attention:

Joint attention skills refer to the use of both signaling and eye contact to achieve a social goal, which is to share someone's interest in something or an event. Joint attention is divided into two main types:

A. **Response to Joint Attention:** This is the child's ability to follow another person's gaze, head movements, and gestures, where the child is able to look at the same target that the other person is focusing on. It also refers to the

child's response to the other person's attempt to initiate joint attention, such as following the other's gesture, turning their head towards the other, or shifting their gaze.
Response to joint attention refers to the number of attempts in which the child successfully turns their head and eyes in the same direction as the person's gaze and to the location being pointed to. (Ismail Ali, 2017, p. 8)
There are two levels of response to joint attention:

- **Lower level:** Pointing to a nearby object.
- **Higher level:** Turning the head or eyes to track the object (left and right).

B. Initiating Joint Attention: This refers to the child's ability to use eye contact, pointing, and showing as skills to initiate and attract the other person's attention to objects or events of interest. It involves the child using joint attention skills, such as eye contact, pointing, and showing, to share attention with the partner towards objects and events. (Ismail Ali, 2017, p. 11)
There are two levels of initiating joint attention:

- **Lower level:**
- **Eye contact:** The child engages in eye contact while focused on a toy.
- **Alternating gaze:** The child alternates eye contact between a moving toy and the person.
- **Higher level:**
- **Pointing:** The child points to a moving toy or to distant objects in the room.
- **Showing:** The child displays and shows objects (looks at an object and then raises it toward the person's face). (Abdel Hafiz, 2018, p. 70)

3. The Importance of Joint Attention in Child Development:
Joint attention is one of the most important skills that infants acquire in the early months of their development. It serves as a good indicator for the acquisition of verbal language and other cognitive skills. Joint attention has been linked to both social and linguistic development. Researchers believe that joint attention is a predictor of the emergence of higher social cognitive abilities, which are essential for language development. There is also a close relationship between language development and joint attention skills. Studies have shown that mothers who spend longer periods of time with their children engaging in joint attention activities see an increase in their children's language skills at a later stage. (Abdel Hafiz, 2018, p. 95)
Joint attention includes basic skills that develop early in a child's life, during which social coordination with others is built through shared experiences. Joint attention is not just two people looking at each other or at the same object, but rather, there is synchronization between the participants to organize their attention towards the object and the other person. This is achieved through skills such as eye contact, gaze shifting, pointing at the object, initiating a request, and responding to others. Joint attention influences cognitive, social, linguistic, and emotional development. (Osran, 2022, p. 167)
Joint attention plays a significant role in the development of both language and subsequent social and cognitive skills. Maureen (2008) mentions that joint attention is an essential element for achieving optimal child development because it is considered:

- The cornerstone for forming a basic social cognitive ability for language acquisition, social interaction, emotional engagement, cultural learning, and theory of mind.
- A pivotal foundational skill, as its development results in positive changes in other functional areas and improvement in subsequent learning. (Ismail Ali, 2017, p. 11)

4. The Development of Pointing Skills:
Pointing is one of the most important skills in joint attention. It involves extending a finger toward something to express interest, and it typically emerges around the ninth month. There are two types of pointing:

- **Pointing to Request Objects:** Known as mandatory pointing (imperative pointing), where the child points to their favorite toy that is out of reach and makes sounds to express their desire to get it or because they want the adult's help to operate, open, or close something.
- **Pointing to Share Social Enjoyment:** Known as declarative or expressive pointing, where the child points to or shows others objects because they want them to share in the social enjoyment of the object, not with the aim of obtaining a material item.

Children with autism spectrum disorders often lack these two types of pointing, and a significant number of them do not use pointing at all. However, some of them develop pointing skills in both forms, although they develop them later. Pointing for social purposes tends to develop later than pointing for requesting, and in many cases, it does not develop at all. (Ismail Ali, 2017, p. 11)
We can distinguish between the declarative (descriptive) function and the imperative (obligatory) function of joint attention, which correspond to different aspects of social-cognitive development and should be considered separately. The declarative function (social enjoyment) of joint attention refers to the shared focus on something to communicate interest in it. The imperative function of joint attention is used to achieve a specific goal, such as obtaining something or

prompting someone to do something useful to achieve an objective. The term joint attention is primarily used in reference to the declarative use of this communicative behavior, while the term behavioral request refers to the imperative use of joint attention. We use the term "initiating joint attention" when the child starts the interaction, and "responding to joint attention" when the child responds to a call from an adult. The same terms can be applied to initiating and responding to behavioral requests.

Children begin to use pointing toward the end of their first year, around the same time they develop joint attention skills. Additionally, the skill of gaze following develops toward the end of the first year, and it is linked to the development of joint attention (Montagut-Asunción et al., 2022, p.1).

Tomasello and Canaioni (1997) point out that children with autism have difficulties producing and understanding declarative pointing rather than imperative pointing. Children with autism do not struggle with understanding others as causal agents (i.e., as actors influencing events), but they face challenges in understanding others as psychological agents with whom they can share experiences. The absence of gestures with a declarative function in children with autism may serve as an early indicator for diagnosing autism during the second year of life (Thommen, Rossini, Di Fulvio, Rudelli, Cattelan, Zecchin, et Guidetti, 2016, p.449).

5. The Development of Joint Attention in Typically Developing Children

Infants, as early as 3 to 6 months of age, begin to develop an impressive ability to coordinate their attention with a social partner concerning a third object or event. Bruner and Sherwood (1983) referred to this as the development of joint attention skills (Mundy & Sigman, 2015, p.293).

The transition of infants from dyadic interactions (between two people) to triadic interactions (involving two people and an external object) is a pivotal change in the development of early communication. Dyadic interactions emerge early after birth, around two to three months of age, allowing mothers and infants to exchange facial, bodily, and vocal expressions in the context of face-to-face communication. Triadic interactions, on the other hand, engage the participants in communication about something external to the personal context. These interactions are usually observed after several months, around the end of the first year of life.

While dyadic interactions are limited to conveying emotional and affective content, triadic interactions allow for the sharing of intentions and meanings. The ability to engage in triadic interactions emerges toward the end of the first year of life. However, infants recognize the triadic structure of the interactive context much earlier. By the age of three months, infants can track others' visual attention toward external objects. This ability improves over the following months, as infants become able to actively coordinate their visual attention between people and objects and recognize the link between the two. Furthermore, they can distinguish between face-to-face interactions and interactions between a person and an object by the age of three months, as well as differentiate between different types of interactions between a person and an object (Aureli, T. Presaghi, F. & Garito, M. C. 2018, p.2).

Joint attention refers to the cognitive ability to adopt a common frame of reference in order to share experiences and process information about a shared reference with others. Joint attention can be measured in typical development by the age of 4 to 6 months, and in infants at risk for autism spectrum disorder by the age of 8 to 9 months.

Two types of joint attention are commonly measured. The first is response to joint attention, which is the infant's ability to track the line of gaze and/or pointing gestures from others. The second is initiation of joint attention, which is the infant's ability to direct the attention of others. These two types are essential in the early identification of children affected by or at risk for autism spectrum disorder during the preschool years (Mundy, P. Novotny, S. Swain-Lerro, L. McIntyre, N. Zajic, M, & Oswald, T, 2017, p.3).

Brooks and Meltzoff (2005) observed that infants at the age of 9 months engage in joint attention behavior before they fully develop in the areas of social-cognitive awareness. Joint attention responses can be measured as early as 6 months, and language ability at 24 months can be predicted (Mundy, P., & Newell, L., 2007, p.3).

Joint attention skills begin to emerge around the sixth month and then develop with the ability to respond to joint attention, followed by initiating joint attention. As the child grows, verbal skills also develop, and by the ninth month, they are able to follow the gaze of others. By the twelfth month, they become capable of tracking another person's eye gaze. Signals used to share attention with or attract the attention of another person develop fully by the twelfth month. Most researchers agree that joint attention starts to appear between the sixth and twelfth months of a child's life and becomes solidified before the twelfth month. (Abdel Hafiz, 2018, p. 81)

6. Deficiency in Joint Attention in Children with Autism and its Indicators:

One of the key characteristics of children with autism spectrum disorder, distinguishing them from other children with developmental disabilities, is the deficiency in joint attention skills. Deficiency or lack of joint attention skills is an early sign in the diagnosis of autism and affects 80-90% of children with autism. These children face problems, the most prominent of which is the lack of joint attention, which is accompanied by issues in both verbal and non-verbal communication. Consequently, children with autism suffer from deficiencies in social communication or social interaction in general. This deficiency leads to secondary behavioral problems arising from the primary difficulties based on a deficiency in joint attention (Osran, 2022, p. 159)

Among the indicators of impaired joint attention in children with autism spectrum disorder:
1. They show a deficiency in the ability to follow someone else's gaze.
2. They fail to look where others point.
3. They exhibit a lack of pointing to objects.
4. They do not respond when their names are called.
5. They have difficulty tracking the head movements of others.
6. They lack spontaneous seeking of engagement in shared enjoyment, interests, and accomplishments with others.
7. They do not attract others' attention to surrounding topics or events.
8. They use pointing to request something specific rather than to share something. (Al-Atifi, Al-Hudaybi, Jalal, 2023, p. 133)

The indicators of a deficit in joint attention among children with autism spectrum disorder include failing to look where others point, showing an inability to meet the gaze of another person, having a weakness in pointing at objects, not responding when their names are called, being unable to track the direction of others' head movements, lacking the ability to draw others' attention to objects, topics, or events in the environment, reduced ability to share interests or activities with others, and using pointing to request a specific item rather than participating in something. Additionally, they have a deficit in spontaneously seeking to share interests with others (Al-Zubaidi, 2022, p. 55).

Reports from parents and caregivers of children with autism indicate that eye contact is minimal during the first and second years of life, and there is a lack of skills related to pointing, showing objects, sharing, and taking turns. These previous skills are integral components of joint attention. The complete absence of joint attention at the age of 18 months is a predictive indicator of an autism diagnosis. Several studies have shown that children with autism spectrum disorder exhibit deficiencies in joint attention skills. For example, they do not respond to joint attention from their typically developing peers. Therefore, the lack of joint attention before the age of one is considered one of the early signs and indicators of autism spectrum disorder (Abdel Hafiz, 2018, p. 85).

7. Previous Studies on Joint Attention in Individuals with Autism:

Below is a presentation of a set of recent studies that focused on the topic of joint attention in individuals with autism spectrum disorder (ASD):

1.Gaze Following as an Early Diagnostic Marker of Autism in a New Word Learning Task in Toddlers (2024), Camero, R., Gallego, C., & Martí

The aim of this study was to test the use of eye-tracking technology for the early detection of autism spectrum disorder during a task that links unfamiliar objects with words. Significant differences were found between Spanish-speaking toddlers with autism (n = 57) and typically developing children (n = 57) in terms of the number and duration of visual fixations.

Typically developing children showed longer and more frequent fixations on the eyes and mouth, while children with autism almost exclusively focused on objects, making it difficult to integrate lexical and auditory information. Also, typically developing children looked at the speaker's mouth during word pronunciation, unlike children with autism.

Gaze fixation on eyes and mouth during word learning could serve as an important marker for early autism diagnosis. The study showed that children with autism focus more on objects than on faces when learning words, which affects language acquisition and supports eye-tracking as a useful early diagnostic tool.

2.Visual Attention in Joint Attention Bids: A Comparison Between Toddlers with Autism Spectrum Disorder and Typically Developing Toddlers (2024), Ozdemir, S., Akin-Bulbul, I., & Yildiz, E.

This study aimed to explore differences in visual attention between toddlers with autism and those with typical development. It also examined the relationship between visual attention and cognitive, linguistic, and motor development among participants.

The sample included 56 toddlers with autism and 56 typically developing toddlers aged 18 to 36 months. A passive viewing paradigm was used to assess visual attention across four different joint attention scenarios.

Results showed that toddlers with autism exhibited limited visual attention toward areas of joint attention interest, including the target and the face, whether individually or combined. As the intensity of joint attention cues increased, children with autism showed increased visual focus toward the target area more than the face.
An increase in visual attention to joint attention areas was associated with improvements in cognitive and language development in children with autism.

Thus, the study found that children with autism demonstrate limited visual attention to faces during joint attention, which impacts their cognitive and language development.

3.Eye-tracking Correlates of Response to Joint Attention in Preschool Children with Autism Spectrum Disorder (2023), de Belen, R. A., Pincham, H., Hodge, A., Silove, N., Sowmya, A., Bednarz, T., & Eapen, V

Eye-tracking technology was used to evaluate joint attention response behaviors in 77 children aged 31 to 73 months.

Results showed that children with autism spectrum disorder were less likely to follow gaze direction compared to typically developing peers. They were also less accurate in following gaze when the available cues were limited to eye movement alone, compared to situations that involved both eye and head movements.
More accurate gaze-following patterns were associated with better early cognitive function and increased adaptive behaviors in children with autism, while less accurate patterns were linked to greater severity of autism symptoms.
The study demonstrated that children with autism are less accurate in tracking others' gaze, particularly when cues are limited to eye movement alone.

4.Social Orienting and Initiated Joint Attention Behaviors in 9 to 12-Month-Old Children with Autism Spectrum Disorder: A Family Home Movies Study (2022), Palomo, R., Ozonoff, S., Young, G. S., & Belinchón Carmona, M
This study hypothesized that impaired social orienting is the first behavioral manifestation of autism and that it is developmentally linked to joint attention deficits.
Researchers analyzed family home videos of children aged 9 to 12 months, 29 of whom were later diagnosed with autism and 16 who exhibited typical development. They compared social orienting behaviors (social gaze and name response) and joint attention behaviors (gaze alternation and gestures).
The results revealed that infants later diagnosed with autism showed less response to their names and a deficiency in initiating joint attention during their first year of life.

5.Joint Attention and Its Relationship with Autism Risk Markers at 18 Months of Age (2022), Montagut-Asunción, M., Crespo-Martín, S., Pastor-Cerezuela, G., & D'Ocon-Giménez, A
This longitudinal study aimed to assess joint attention skills in a group of 32 infants at two stages of development (8 and 12 months) to explore whether their performance in this skill is related to early markers of autism spectrum disorder at 18 months.
The results showed that initiating joint attention at 8 months and responding to it at 12 months were both related to the risk of autism at 18 months. Early joint attention skills play a pivotal role in identifying early manifestations of autism spectrum disorder.

6. Visual Traces of Language Acquisition in Toddlers with Autism Spectrum Disorder During the Second Year of Life (2021), Habayeb, S., Tsang, T., Saulnier, C., Klaiman, C., Jones, W., Klin, A., & Edwards, L. A
Infants exhibit changing patterns of visual interaction with faces during the early years of life. To explore the adaptive significance of this interaction, researchers collected eye-tracking measurements from a sample of toddlers aged 10–25 months, including 28 typically developing children and 54 children with autism spectrum disorder (ASD).
Simultaneous language assessments were conducted, and the relationship between visual interaction and both expressive and receptive language was analyzed across the groups.
Both groups showed a greater visual focus on the mouth compared to the eye-looking. However, typically developing children exhibited higher levels of focus on the mouth-looking than children with ASD. In typically developing children, as well as in autistic children who had already acquired their first words, focusing on the mouth-looking was positively associated with expressive language development. In contrast, no such association was found in autistic children who had not yet acquired their first words.
Thus, the study demonstrated that typically developing children focus more on the mouth-looking when listening to speech, which facilitates language learning. This focus is reduced in children with autism, affecting their language acquisition.

7. Initiation and Response of Joint Attention Bids in Autism Spectrum Disorder Children Depend on the Visibility of the Target (2020), Cilia, F., Touchet, C., Vandromme, L., & Driant, B. L
This study aimed to investigate joint attention behaviors in children with autism spectrum disorder (ASD) during their interactions with adults, depending on the type of referential cue used (such as head and eye direction, pointing, or verbal expressions). The sample consisted of 50 children with ASD aged between 2 years and 8 months and 11 years and 7 months, all with a communicative level comparable to children under 31 months. They were compared with 50 typically developing children aged 9 to 30 months who had no communication disorders.
The study's findings were as follows: there was no difference in the number of joint attention initiations between the groups, but children with ASD were less responsive than typically developing children. Additionally, developmental progress was noted in the responses of autistic children when multiple cues were used simultaneously by the adult (looking and pointing, or looking and verbalising to indicate a target), whether the referent (object) was present or absent from the child's visual field. Furthermore, developmental gains were observed when the referent was behind the child and the adult only used their gaze to refer to it
The researchers concluded that the type of cue used significantly affects response behaviors in children with ASD during joint attention towards a referent that may be present or absent from their visual field.

In summary, the study found that children with autism are more responsive when multiple cues (visual and auditory) are combined, indicating the potential for enhancing their responses through multimodal communication strategies.

8. Altered Gaze Following During Live Interaction in Infants at Risk for Autism: An Eye Tracking Study (2016), Thorup, E., Nyström, P., Gredebäck, G., Bölte, S., & Falck-Ytter, T.

Eye tracking was used to evaluate gaze-following behavior during live interaction in a group of 10-month-old infants at high familial risk for autism spectrum disorder (high-risk group) and a group of infants with no family history of autism (low-risk group). The infants watched an experimenter gaze at objects in the environment. Their performance was compared across two conditions: one in which the experimenter moved both the eyes and head toward the object (Eye-and-Head condition), and another in which only the eyes moved (eyes-only condition).

The results showed that low-risk infants followed gaze in both conditions. In contrast, high-risk infants were more likely to follow gaze in the eyes-and-head condition than in the eyes-only condition.

The results indicate that infants at risk for ASD may rely disproportionally on information from the head when following gaze and point to the importance of separating information from the eyes and the head when studying social perception in ASD.

Thus, the study found that infants at risk for autism depend more on head movement than eyes movement when following others' gaze, indicating an early impairment in social perception.

Commentary on the Previous Studies:

From the studies reviewed above, we can conclude the following key points:

- **Objective:** Most studies focus on the early detection of autism spectrum disorder, analyzing joint attention behaviors, and using techniques such as eye tracking to understand the perceptual and cognitive differences between children with autism and typically developing children.
- **Sample:** Most studies used samples of young children (from 9 months to 6 years), with some focusing on infants and others on older children.
- **Tools Used:** Some studies employed direct eye tracking, while others relied on home video analysis or observational rating scales.
- **Findings:** All studies showed that children with autism differ from typically developing children in visual attention behaviors, such as focusing more on objects than on faces or eyes. Many studies also found a positive correlation between improved visual attention and joint attention with language and cognitive development in children with autism. This suggests a strong relationship between linguistic/cognitive skills and joint attention abilities. Impairments in gaze following and eye contact are considered early indicators of autism. Additionally, using multiple cues (e.g., gaze and pointing) can enhance the responsiveness of children with autism during joint attention interactions compared to using a single cue.

From the above, we can also infer that most studies focused on eye, face, head, and mouth tracking, as well as gesture use. Attention to these elements is essential for improving social behavior. Focusing on the eyes and mouth is particularly important for language acquisition—the mouth helps with understanding pronunciation and spoken language, while the eyes help in grasping the meaning of observed behavior. Therefore, impairments in following gaze, mouth movements, facial expressions, and gestures in children with autism can negatively impact their later developmental gains.

It can be concluded that joint attention plays a pivotal role in language and cognitive development, and it may serve as an early indicator of autism spectrum disorder. Eye tracking can be an effective tool for early detection of autism, especially through analyzing patterns of visual focus on faces and objects.

Joint attention and its components are considered fundamental elements for understanding and diagnosing autism spectrum disorder. By studying and analyzing these behaviors, it is possible to identify children who may be at higher risk of developing the disorder at an early age. This early identification serves as a gateway to effective therapeutic interventions, which can significantly contribute to improving their quality of life and enhancing their developmental trajectory.

Conclusion:

As a conclusion to what has been previously discussed, joint attention is one of the key indicators for diagnosing autism spectrum disorder. Individuals with autism often experience deficits in skills such as eye contact, gaze exchange, use of gestures, staring, following head and eye directions, and non-verbal communication. These deficits can affect their ability to engage socially and communicate with others, which in turn impacts their cognitive and language development. Therefore, it is essential to focus on developing and enhancing joint attention skills at an early age to reduce the likelihood of autism spectrum disorder. According to several studies, as far as we know, early and intensive interventions aimed at improving joint attention can significantly enhance the social and communicative abilities of children with autism. Furthermore, by using individualized educational strategies and behavioral techniques, these

individuals can develop their joint attention skills, which contributes to improving their quality of life and their ability to interact with the external world. Adequate awareness of this deficit and the provision of effective solutions represent a vital step toward supporting this population and enabling them to develop their skills.

Ultimately, understanding joint attention deficits in individuals with autism requires cooperation among families, specialists, and society, through scientific research and practical experiences. Based on this, we propose the following recommendations for future studies:

- Expand research on joint attention deficits in Arab contexts.
- Explore the impact of early interventions on improving joint attention and visual behaviors in children with autism.
- Further investigate the hypothesis that children with autism tend to focus on the mouth and eyes regions.

References

- Ismail Ali, Amira Ahmed. (2017). *Joint Attention Rating Scale for Children with Autism Spectrum Disorder*. Cairo: Anglo Egyptian Bookshop.
- AL-Thaqafi, Talal. (2014). *The Effectiveness of a Program Based on Joint Attention to Develop Verbal Communication in Children with Autism in Taif Governorate* (Unpublished Master's thesis). Faculty of Education: Umm Al-Qura University.
- Al-Adl, Adel Mohamed. (2013). *Learning Disabilities and the Impact of Early Intervention and Educational Inclusion for Individuals with Special Needs*. Cairo: Dar Al-Kitab.
- Al-Zubaidi, Samara. (2022). *The Effectiveness of a Training Program Based on Joint Attention in Developing Emotion Understanding in Children with Autism* (Unpublished Master's thesis). Faculty of Education for Humanities: University of Karbala.
- Al-Zureikat, Ibrahim Abdullah Faraj. (2004). *Autism: Characteristics and Treatment*. Amman: Dar Wael.
- Al-Atifi, Zeinab Mahmoud, Al-Hudaybi, Mostafa Abdul Mohsen, & Galal, Sherine Arabi Ibrahim. (2023). *Psychometric Properties of the Perceived Joint Attention Scale for Children with Autism Spectrum Disorder*. *Studies in Psychological and Educational Counseling*, 6(2), 131–152. https://doi.org/10.21608/dapt.2023.303915.
- Ben Sediq, Lina Omar. (2007). *The Effectiveness of a Proposed Program to Develop Nonverbal Communication Skills in Children with Autism and Its Impact on Their Social Behavior*. *Arab Childhood Journal*, 9(33), 8–39. Retrieved from search.shamaa.org.
- Jaber, Sherif Adel. (2022). *The Effectiveness of a Training Program Based on Virtual Reality Technology in Enhancing Joint Attention in a Sample of Children with Autism Spectrum Disorder*. *Journal of Educational and Psychological Sciences*, 6(26), 36–57. https://doi.org/10.26389/AJSRP.B050422.
- Abdel-Hafiz, Hanaa Shehata Ahmed. (2018). *Joint Attention and Verbal Communication in Children with Autism Spectrum Disorder*. Algeria: Dar Atfalona.
- Abdel-Aal Mohamed, Omaima Mostafa, Ibrahim Sayed, Sahar Hassan, Ajwah, Mohamed Saeed Sayed, & Qarni, Amal Abdel-Ghani. (2023). *Differences in Joint Attention Skills in Children with Autism Spectrum Disorder According to the Severity of the Disorder*. *Journal of Special Needs Sciences*, 5(11), 850–892. https://doi.org/10.21608/jshm.2023.328263
- Abdullah, Bakr Mohamed Said, & Mohamed Ibrahim, Jehan Mohamed. (2023). *Effectiveness of a Cognitive-Behavioral Program Based on Activating Prefrontal Cortex Functions to Develop Joint Attention in Children with Autism Spectrum Disorder in Early Childhood*. *Benha Faculty of Education Journal*, 34(133), 335–396. https://doi.org/10.21608/jfeb.2023.307531
- Osran, Kareem Mansour. (2022). *The Effectiveness of a Sensory Integration-Based Training Program in Improving Joint Attention and Its Impact on Social Communication in Children with Autism Disorder*. *Journal of Special Education*, 11(41), 154–226. https://doi.org/10.21608/mtkh.2022.283498
- Ali, Mahmoud Ali Aziz Al-Din, Shaheen, Hayam Saber, & El-Bahairy, Mohamed Rizk. (2022). *Joint Attention and Its Relationship with Communication in Children with Autism Spectrum Disorder*. *Journal of Educational Research and Innovation*, 2(6), 33–55. https://doi.org/10.21608/erji.2022.244373
- **Aureli, T., Presaghi, F., &Garito, M. C.** (2018). Mother–infant co-regulation in dyadic and triadic contexts at 4 and 6 months of age. *Infant and Child Development*, 27(3), 1–14. https://doi.org/10.1002/icd.2072
- **Camero, R., Gallego, C., & Martínez, V.** (2024). Gaze Following as an Early Diagnostic Marker of Autism in a New Word Learning Task in Toddlers. *Journal of Autism and Developmental Disorders*, 54(9), 3211–3224. https://doi.org/10.1007/s10803-023-06043-1
- **Cilia, F., Touchet, C., Vandromme, L., & Driant, B. L.** (2020). Initiation and response of joint attention bids in autism spectrum disorder children depend on the visibility of the target. *Autism&DevelopmentalLanguageImpairments*, 5, 2396941520950979. https://doi.org/10.1177/2396941520950979

- **de Belen, R. A., Pincham, H., Hodge, A., Silove, N., Sowmya, A., Bednarz, T., &Eapen, V.** (2023). Eye-tracking correlates of response to joint attention in preschool children with autism spectrum disorder. *BMC Psychiatry*, 23(1), 211. https://doi.org/10.1186/s12888-023-04585-3
- **Guillon, Q., Hadjikhani, N., Baduel, S., &Rogé, B.** (2014). Visual social attention in autism spectrum disorder: insights from eye tracking studies. *Neuroscience and BiobehavioralReviews*, 42, 279–297. https://doi.org/10.1016/j.neubiorev.2014.03.013
- **Habayeb, S., Tsang, T., Saulnier, C., Klaiman, C., Jones, W., Klin, A., & Edwards, L. A.** (2021). Visual Traces of Language Acquisition in Toddlers with Autism Spectrum Disorder During the Second Year of Life. *Journal of Autism and Developmental Disorders*, 51(7), 2519–2530. https://doi.org/10.1007/s10803-020-04730-x
- **Montagut-Asunción, M., Crespo-Martín, S., Pastor-Cerezuela, G., &D'Ocon-Giménez, A.** (2022). Joint Attention and Its Relationship with Autism Risk Markers at 18 Months of Age. *Children*, 9(4), 556. https://doi.org/10.3390/children9040556
- **Mundy, P., & Newell, L.** (2007). Attention, Joint Attention, and Social Cognition. *Current Directions in Psychological Science*, 16(5), 269–274. https://doi.org/10.1111/j.1467-8721.2007.00518.x
- **Mundy, P., & Sigman, M.** (2015). Joint attention, social competence, and developmental psychopathology. *Developmental Psychopathology: Volume One: Theory and Method*, 293-332.
- **Mundy, P., Novotny, S., Swain-Lerro, L., McIntyre, N., Zajic, M., & Oswald, T.** (2017). Joint-attention and the social phenotype of school-aged children with ASD. *Journal of Autism and DevelopmentalDisorders*, 47, 1423-1435.
- **Ozdemir, S., Akin-Bulbul, I., &Yildiz, E.** (2024). Visual Attention in Joint Attention Bids: A Comparison Between Toddlers with Autism Spectrum Disorder and Typically Developing Toddlers. *Journal of Autism and Developmental Disorders*. Advance online publication. https://doi.org/10.1007/s10803-023-06224-y
- **Palomo, R., Ozonoff, S., Young, G. S., &Belinchón Carmona, M.** (2022). Social orienting and initiated joint attention behaviors in 9 to 12 month old children with autism spectrum disorder: A family home movies study. *AutismResearch*, 15(6), 1109–1119. https://doi.org/10.1002/aur.2695
- **Papagiannopoulou, E. A., Chitty, K. M., Hermens, D. F., Hickie, I. B., &Lagopoulos, J.** (2014). A systematic review and meta-analysis of eye-tracking studies in children with autism spectrum disorders. *Social Neuroscience*, 9(6), 610–632. https://doi.org/10.1080/17470919.2014.934966
- **Riddiford, J. A., Enticott, P. G., Lavale, A., &Gurvich, C.** (2022). Gaze and social functioning associations in autism spectrum disorder: A systematic review and meta-analysis. *AutismResearch*, 15(8), 1380–1446. https://doi.org/10.1002/aur.2729
- **Thommen, É., Rossini, E., Di Fulvio, A., Rudelli, N., Cattelan, C., Zecchin, M. et Guidetti, M.** (2016). Le pointage dans l'autisme : Évolution de la compréhension et de la production après 6 mois d'intervention précoce. *Enfance*, N° 4(4), 445-459. https://doi.org/10.3917/enf1.164.0445
- **Thorup, E., Nyström, P., Gredebäck, G., Bölte, S., Falck-Ytter, T., & EASE Team** (2016). Altered gaze following during live interaction in infants at risk for autism: an eye tracking study. *MolecularAutism*, 7, 12. https://doi.org/10.1186/s13229-016-0069-9