Cognition and Learning Environments for Individuals with Autism Spectrum Disorder. A Social Perspective*
[English version]

Cognición y ambientes de aprendizaje para personas con trastorno del espectro autista. Una mirada social

Cognição e ambientes de aprendizagem para pessoas com transtorno do espectro autista. Uma perspectiva social

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Abstract

Objective: To understand the lived experiences related to cognition and learning environments for individuals with Autism Spectrum Disorder (ASD) from a social perspective. **Methodology**: Interpretative paradigm with a phenomenological approach. Data collection was carried out through semi-structured interviews and field journals. Participants: Three teachers, three experts, two mothers, and one person diagnosed with ASD. **Results**: The experiences revolve around difficulties in communication, social interaction, language, behavior patterns, interests, and conduct, among others. **Conclusions**: Across different domains and roles, emphasis is placed on adaptations concerning sensory processing (SP) or sensory integration (SI) through collaborative efforts involving professionals and families. Finally, the importance of implementing various strategies that support the development of social and communication skills, to improve the educational experiences of this population, is interpreted.

Keywords: cognition; educational needs; learning; educational environment (UNESCO Thesaurus).

Resumen

Objetivo: comprender las experiencias vividas acerca de la cognición y los ambientes de aprendizaje para personas con trastorno del espectro autista desde una perspectiva social. **Metodología**: paradigma interpretativo con enfoque fenomenológico. La recolección de datos se realizó mediante entrevistas semiestructuradas y diarios de campo. Participantes: tres profesores, tres expertos, dos madres de familia y una persona diagnosticada con TEA. **Resultados**: las experiencias giran en torno a las dificultades en comunicación, interacción social, lenguaje, patrones de comportamientos, intereses, conductas, entre otras. **Conclusiones**: desde los distintos ámbitos y roles se destacan las adaptaciones en cuanto al procesamiento sensorial (PS) o integración sensorial (IS) y mediante un trabajo que involucre a profesionales y familias. Finalmente, se interpreta la importancia de implementar diversas estrategias que favorezcan el desarrollo de habilidades sociales, comunicativas y con el objetivo de mejorar las experiencias educativas de esta población.

Palabras clave: cognición; necesidades educacionales; aprendizaje; ambiente educacional (Tesauro UNESCO).

Resumo

Objetivo: compreender as experiências vividas sobre a cognição e os ambientes de aprendizagem para pessoas com transtorno do espectro autista a partir de uma perspectiva social. **Metodologia**: paradigma interpretativo com enfoque fenomenológico. A coleta de dados foi realizada por meio de entrevistas semiestruturadas e diários de campo. Participantes: três professores, três especialistas, duas mães e uma pessoa diagnosticada com TEA. **Resultados**: as experiências giram em torno das dificuldades na comunicação, interação social, linguagem, padrões de comportamento, interesses, condutas, entre outras. **Conclusões**: destaca-se, a partir dos diferentes âmbitos e papéis, as adaptações em relação ao processamento sensorial (PS) ou integração sensorial (IS) e através de um trabalho que envolva profissionais e famílias. Finalmente, interpreta-se a importância de implementar diversas estratégias que favoreçam o desenvolvimento de habilidades sociais, comunicativas, com o objetivo de melhorar as experiências educacionais dessa população.

Palavras-chave: cognição; necessidades educacionais; aprendizagem; ambiente educacional (Tesauro UNESCO).

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder primarily characterized by limitations in communication and social interaction. These include difficulties establishing social relationships, understanding nonverbal cues, repetitive and restricted behavior patterns, and intense focus on specific areas of interest, often manifested in stereotyped behaviors, resistance to change, and other symptoms. The severity and presentation of these symptoms vary across individuals, forming the broad spectrum of this diagnosis (American Psychiatric Association [APA], 2014).

The term "spectrum" carries implications that extend beyond a mere change in terminology, particularly when compared to the International Classification of Diseases and Related Health Problems (World Health Organization [WHO], 2018), as it encompasses Autism, Asperger's Syndrome, Childhood Disintegrative Disorder, and other unspecified pervasive developmental disorders (Grosso, 2021).

As aforementioned, the most prominent characteristics of individuals with ASD include deficits in communication and social interaction, especially with their peers. This phenomenon has been studied from various perspectives. Notably, studies by López et al. (2020), using critical epidemiology with a biopsychosocial approach, refer to the "social brain" of individuals with ASD and demonstrate the numerous theoretical gaps in the literature regarding its abnormal development, in terms of its physical appearance and connectivity.

Similarly, Gordillo et al. (2019) agree that ambiguity persists in the scientific literature regarding the anomalies observed in the social brain of individuals with ASD. However, they assert that the relationship between the amygdala and the prefrontal cortex has gained importance in recent years due to its fundamental role in regulating emotional processes related to social interaction.

Several authors have explored the family's role as a key social actor in the diagnosis and treatment of this population. For instance, López et al. (2020) conducted a study using a critical epidemiology approach and concluded that variations in social and territorial conditions impact families' lifestyles. In contrast, Parra (2017) examined families' emotional responses through their testimonies regarding the diagnosis and specific conditions of children with ASD, highlighting the challenges they faced in this context.

Another perspective, considered from phenomenology, relates to the social interaction of individuals with ASD and their performance in the school context. Studies such as Buemo et al. (2019) highlight the need for adaptations in learning environments and greater awareness among those responsible for the educational and formative processes of individuals with ASD. Similarly, Zambrano and

Orellana (2018) investigated teachers' attitudes toward including students with ASD in formal education, drawing on their personal experiences.

Villamil (2017) discusses how a phenomenological understanding allows for the recognition of the experiences of individuals with ASD in relation to their environment and their interactions with others. From this perspective, studies have explored interventions in occupational therapy for children with ASD, addressing the difficulties experienced, family perceptions, and barriers to adaptations in the learning process (Rodríguez, 2017; Vives et al., 2022). Ruiz et al. (2022) examined the experiences of university students with ASD from a neurophenomenological approach. Their narratives revealed academic challenges and relational dynamics that exposed exclusionary practices within the university context.

The final approach to highlight involves a method that includes various intervention strategies through the participation of multiple social actors. In this regard, Restrepo (2021) proposed adapted communication strategies based on neurodiversity, derived from the experiences of several participants, including three school-aged children, two adults with ASD, four teachers, and one expert. This study emphasizes the importance of considering the role of each of these individuals in the communication process. Additionally, Coy and Martín (2017) explored social and communication skills through art as a medium of expression, using a phenomenological and ethnographic perspective, which revealed improvements in the socialization processes of the participants.

The present study addresses learning environments, cognition, and how a group of social actors in different contexts (personal, family, educational, and/or professional) and roles are related to the learning environments of individuals with ASD. Therefore, the general objective was to understand the lived experiences of a group of people who had some contact or relationship with individuals with ASD, based on the meanings they attributed to learning environments for this population. The specific objectives were: to understand the lived experiences of four educational social actors (teacher, family members or guardians, expert, and person with ASD) regarding learning environments for individuals with ASD; to compare common and different experiences through units of meaning related to learning environments of individuals with ASD; and finally, to interpret the meanings and divergences in how the phenomenon was experienced based on the lived experiences of the social actors.

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Methodology

This study is grounded on an interpretative paradigm, with the objectives being approached through phenomenology. This perspective aims to determine the meaning given to phenomena, discover its significance, and understand how people describe their experiences in a specific event (Sabariego et al., 2009, p. 317). Thus, a dialogue is established with those who have lived certain experiences that, in one way or another, relate to the situation or phenomenon under study, including their contexts, circumstances, and anecdotes, among other aspects (Husserl, 1982, 1992). According to Van Manen (2003), this constitutes the interpretative study of expressions and texts, in an attempt to determine the correct meaning, they express (p. 11). From the same perspective, it tries to explain the meanings that are, in a sense, implicit in actions. Humans gain information through their bodies, relationships with others, and interactions with objects in the world (Van Manen, 2003, p. 11).

Unit of Analysis and Unit of Observation

The unit of analysis corresponded to "cognition and learning environments for individuals with ASD from different contexts and social roles". Participants were selected based on their relationship with individuals with ASD in various contexts (family, educational, and/or professional).

The selection criteria were as follows: being of legal age and having some connection to a learning environment for individuals diagnosed with ASD in any capacity (personal—individual with an ASD diagnosis—familial, educational, professional, or expert).

Informed consent was obtained from nine individuals: three teachers (two secondary education teachers, and one higher education teacher in Arts and Humanities); three experts (a psychology expert, a medical expert trained in ASD testing and diagnostics, a consulting expert for families of individuals with ASD); two mothers of children diagnosed with ASD; and one adult woman diagnosed with ASD. After obtaining informed consent, the participants voluntarily attended the sessions and allowed the authors to access their daily environments.

Data Collection Techniques and Instruments

The semi-structured interview technique was chosen based on Creswell's (2007) recommendations on phenomenology and its procedures for engaging with a small number of subjects, through extensive and prolonged interviews to develop patterns and relationships of meaning (p. 25). This involved a protocol of basic questions (descriptive, anecdotal, experiential, example-based, and emic language, among others) related to the object of study and according to the participant's domain of action or social space to facilitate a fluent conversation (Corbetta, 2007).

These protocols were validated by expert judgment (a social sciences expert, a pedagogy expert, and a psychology expert). This process was carried out in four stages: design of the instruments, evaluation by expert judgment, adjustment, and redesign of the protocols. Based on the first version of the instruments, the judges evaluated each item's relevance using a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree). Following the requested adjustments and approval of the changes, the final evaluation by the expert group yielded a Cronbach's alpha coefficient >0.90, indicating high internal consistency. A pilot test was subsequently conducted to identify modifications, adaptations, and/or reasonable adjustments, particularly for the population with ASD.

Given the characteristics of a phenomenological study, additional questions that arose during the sessions were also asked. To safeguard each interviewee's identity, they were assigned a code: T (Teacher), Ex (Expert), M (Mother), PA (Person with ASD).

Another instrument used was the field journal, where detailed records of environments, reflections, events, and interpretations from the participants were kept (Restrepo, 2018) during the different sessions.

Data Collection Procedure and Analysis

The information analysis followed Creswell's (2007) guidelines for phenomeno-logical studies, focusing on information management, reading and note-taking, description, classification, and interpretation.

The interview questions were organized according to the case (Teacher, Expert, Mother, Person with ASD) using a matrix in *Microsoft Excel*, which included: purpose of the interview, category, purpose of the question(s), type of questions, context, and observations. The interviews were recorded in real-time using *Google Meet* video service, with prior informed consent.

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The data processing was supported by *ATLAS.ti* software (V.7.5.4). For the analysis, transcriptions of the responses obtained and the corresponding field journal notes were used.

Following Creswell (2007), during the interpretation phase, a "textural description" was created, identifying "common categories" (narratives shared by the interviewees) and "different categories" (narratives unique to each experience, depending on the context or field of action: personal—as an individual with an ASD diagnosis— familial, educational, professional, or as an expert). Finally, the "Discussion" section presents the categories with the greatest relevance.

Results

The unit of analysis, "cognition and learning environments for individuals with ASD from different contexts and social roles," led to the establishment of the pre-category: "design of learning environments for individuals with ASD." It is important to highlight that these questions were part of a more in - depth study. The study included other categories of analysis such as training, education, evaluation, contributions, and planning (Salazar, 2022).

Drawing from Creswell's (2007) approach, the "textural description" is presented to answer what happened, compare experiences, identify common and different categories, and understand how the phenomenon was experienced.

Textural Description

Creswell (2007) proposes the development of a textural description to address the question, "What happened?", in this case, by comparing the lived experiences related to the design of learning environments for people with ASD.

In this regard, a series of initial "guiding" questions were established to facilitate an understanding of the social actors' personal experiences concerning the phenomenon under study through "anecdotal," "example," and "contrast" questions (Table 1).

Table 1. *Guiding Questions.*

Objective of the Question	Type of Question	Design of Learning Environments
To identify the experiences of the social actors (What do they feel? What do they think about it? What do they do?).	Anecdotal Questions	Can you describe how your first teaching-learning experience with a person with ASD was?
To understand the strategies for planning, designing, or preparing a learning environment.	Example Questions	Can you share an example of the planning, design, or preparation of a learning environment for individuals with ASD?
To obtain information about the design of a learning environment regarding successes and challenges that may arise.	Contrast Questions	What successes and challenges have you encountered when designing a learning environment for individuals with ASD?

Source: adapted from Salazar (2022).

The textural description was developed by comparing the data collection techniques (interviews and field diaries) (Creswell, 2007). Table 2 provides the textural description along with excerpts from the narratives gathered.

Table 2. *Textural Description*

Interviewee	Interview Excerpt
Teachers	
T1	What I did all the time was a sort of fieldwork in the classroom, like classroom ethnography. So, it allowed me to start identifying how the group was distributed, which students had more affinity with each other, which topics were easier for them, and what learning strategies were more user-friendly. I also asked the students to build together. (Personal communication, March 2, 2021).

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Interviewee	Interview Excerpt
T2	The first thing is that I wouldn't develop a strategy for a student of this type a priori, without first having had classroom experience with them. Let me say that what I would call evaluation of prior knowledge, usually done to students, I would do it first for myself. Second, I would be very concerned, at first, about the level of acceptance the student has in the classroom; for me, that is fundamental! Third, if you want written products, in this case, do collaborative work, and you will get written work. (Personal communication, April 16, 2021).
T3	So, we use color palettes to do an emotional check, I use images or play a song; at these moments, they receive printed cards which they can fill in, we can write "collaborative work" to work on socio-emotional skills... I believe that if we manage to work on and develop some socio-emotional skills with the group and with the boy or girl, we will make significant progress! ...we will make progress...because I feel that they will understand him/her from a more integral, much more emotional perspective, not just because of his/her diagnosis. (Personal communication, May 2, 2021).
Experts	
Ex1	It is very complex because there isn't something very generic, and it all depends on the particular case. Always keep the literal part in mind... the language when providing an explanation or during an evaluation; it is very important that the statements are clear, that there is no double meaning. Many multiple-choice questions, one with the other, are very similar, and that is going to confuse and frustrate people with autism. Consider the sensory aspect, whether the classroom where the evaluation is taking place, or the classroom itself, is too hot, too cold, or too humid. (Personal communication, May 12, 2021).

Interviewee	Interview Excerpt
Ex2	The first is a strategy I call "economy of words" […] people with autism process information in a different way and at a different speed than we do, and that will depend a lot on each particular child. A second strategy is "sensory breaks"; usually, for a child with autism, sitting still, concentrating, and staying engaged with what is happening in a class for the same periods as their peers is a great challenge! Many children with autism need to move, need to reduce auditory stimulation, need to spin, need something we call sensory breaks. And third, when the child has to do group work, the teacher must ensure that the expectations and the child's role within the group are clearly defined. (Personal communication, May 22, 2021).
Ex3	I would tell you that there are strategies for each child, but ''I´ll tell you in general what most people with autism share… many children with autism in the classroom get irritated by noise, with all the students talking at the same time, with certain lights, with the amount of decoration and information stimuli around; so, we have to be very careful with the sensory part. (Personal communication, June 3, 2021).
Ex3	The vast majority of people with autism are visual thinkers, but I also have some auditory ones, and I need to know that!... If I'm going to give a one-hour lecture to a visual thinker, that child won't learn! But if I show them a concept map, the child will probably take a mental snapshot of it… many of them have photographic memories, and that will be enough… or if I show them a video, the video will capture their attention. And lastly, I recommend, and what I always insist on, is being very precise and literal, also with language, because they tend to be very concrete. (Personal communication, June 3, 2021).
Mothers	
M1	A different curriculum should be adapted. I don't think there's much to change in the school, Carlos[5] was in first, second, third grade because those were his needs. (Personal communication, April 22, 2021).

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5 The original name has been changed.

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Interviewee	Interview Excerpt
M2	Well, we move a lot based on "developmental milestones" [...] We start setting goals, and as he achieves them, we set new goals. Playing has been very important for him because he is very playful! Visual aids, when we want to tell him something, and he doesn't understand us, we draw it for him, or when he wants to tell us something, and we don't understand him, he draws it for us, and we understand each other perfectly! (Personal communication, May 18, 2021).
Person Diagnosed with ASD	
PA	Those strategies were not used for the whole group; they were used on me. During breaks, I would go with my teachers to see what they were doing. I don't know what they thought of me! "the weird little bug," "kind of nerdy," "nerdy and a half," they asked me to sit down and made me grade exams... and there... I started to understand the mistakes others made, why they made them, and I could see how others processed things. It's by understanding why mistakes are made that we can avoid making those same mistakes ourselves! (Personal communication, June 12, 2021).

Source: Adapted from Salazar (2022).

From Creswell's (2007) perspective, after textural description, researchers establish "units of meaning" through comparing experiences, identifying "common categories" and "different categories". Below, such categories are presented based on the narratives.

Common Categories

According to the experiences expressed by the participants, the common categories identified were: language, visual aids, sensory processing, and collaborative work. Table 3 presents some excerpts where these aspects are mentioned.

Table 3. *Common Categories.*

Common Categories	Person (Code)
Language	
Keep the literal part in mind. Always! [...] the language when providing an explanation or during an evaluation; it is very important to include clear statements with no double meaning.	Ex1
The first is a strategy I call "economy of words" [...] People with autism process information differently and at a different speed than we do; that will depend a lot on each particular child.	Ex2
And last, what I always insist on is being very precise and literal, also with language, because they tend to be very concrete.	Ex3
Sensory Processing	
With certain lights, with the amount of decoration and information stimuli around, so we have to be very careful with the sensory part.	Ex 3
A second strategy is "sensory breaks"; usually, for a child with autism, sitting still, concentrating, and staying engaged with what is happening in a class for the same periods as their peers is a great challenge!	Ex2
Consider the sensory aspect, whether the classroom where the evaluation is taking place, or the classroom itself, is too hot, too cold, or too humid.	Ex1
Visual Aids	
Visual aids, when we want to tell him something, and he doesn't understand us, we draw it for him, or when he wants to tell us something, and we don't understand him, he draws it for us, and we understand each other perfectly!	M2
The vast majority of people with autism are visual thinkers, but I also have some auditory ones, and I need to know that!	Ex3
Many of them have photographic memories; if I show them a video, the video will capture their attention.	Ex3
The vast majority of people with autism are visual thinkers.	Ex3

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Common Categories	Person (Code)
I use images or play a song.	D3
So, we use color palettes to do an emotional check.	D3
Many children with autism in the classroom get irritated by noise, with all the students talking at the same time.	Ex3
Collaborative work	
Third, if you want written products, in this case, do collaborative work, and you will get written work.	D2
Collaborative work, to work on socio-emotional skills; I believe that if we manage to work on and develop some socio-emotional skills with the group and with the boy or girl, we will make significant progress!	D2
When the child has to do group work, the teacher must ensure that the expectations and the child's role within the group are clearly defined.	E2

Source: adapted from Salazar (2022).

Different Categories

The different categories identified include: play, teamwork, differentiated or differential curriculum, goal setting, classroom acceptance, challenges, and abilities. Table 4 contains some excerpts corresponding to these aspects.

Table 4. *Different Categories.*

Different Categories	Person (Code)
Fieldwork What I did all the time was a sort of fieldwork in the classroom, like classroom ethnography.	T1

Different Categories	Person (Code)
Play Play has been very important with him because he is very playful!	M2
Observing Processes They asked me to sit down and made me grade exams… and there… I started to understand the mistakes others made, why they made them, and I could see how others processed things. It's by understanding why mistakes are made that we can avoid making those same mistakes ourselves!	PA
Setting Goals We start setting goals, and as he achieves them, we set new goals.	M2
Differentiated or Differential Curriculum A different curriculum should be adapted. I don't think there's much to change in the school, Carlos was in first, second, third grade because those were his needs.	M1
Abilities and Challenges Focusing on what their abilities are, what comes easily to them, and also identifying what is difficult for them.	T3
Acceptance in the Classroom I am very concerned, at first, with the level of acceptance they have in the classroom; for me, that is fundamental!	T2
Not Designing Strategies A Priori The first thing is that I wouldn't develop a strategy for a student of this type a priori without first having had classroom experience with him/her.	T2 T2
I also asked the students to build together.	T1

Source: Adapted from Salazar (2022).

Discussion

The discussion of the main categories is presented based on the common categories (language, sensory processing, visual aids, and collaborative work) and the different categories (fieldwork, play, observing processes, goal setting, differentiated or differential curriculum, abilities and challenges, classroom acceptance, and not designing strategies a priori), as referred to by Creswell (2007) as the "essence of the experience".

Communication and Reciprocity

This aspect plays a fundamental role in teaching and learning processes due to the communication difficulties present in individuals with ASD (Aguilera & Orellana, 2017). Some of these difficulties, such as selective mutism, phonological-syntactic syndrome, semantic-pragmatic language disorder, and echolalia (Marzo & Belda, 2021, p. 58), are related, among other factors, to a deficit in central coherence, also known as "weak central coherence" (Marzo & Belda, 2021). According to Hahn et al. (2015), individuals with ASD are frequently reported to have difficulties integrating information into its broader context (p. 3) and often have an information processing style that favors detail processing over global meaning (Gambra et al., 2017, p. 10). Therefore, central coherence is related to the pragmatic use of language and adaptation to the communicative context, where linguistic, social, and cognitive skills converge, and involves understanding the social context (Mendoza & Garzón, 2012).

Consequently, information loaded with numerous statements, extensive instructions, double meanings, metaphors, jokes, or sarcasm tends to confuse students with ASD (Gambra et al., 2017).

Based on the narratives, the more complex the information used by the teacher or others to communicate, the more difficult it will be for the person with ASD to interpret and comprehend its meaning.

Learning Environments and Sensory Processing

Sensory Processing (SP) or Sensory Integration (SI) relates to the perception, organization, and interpretation of sensations captured through sensory systems and their transformations, leading to adaptive responses (Ayres, 2005; Kilroy et al.,

2019; Fonseca et al., 2020). For this reason, there is a close relationship between sensory integration and learning (Vives et al., 2022, p. 1).

According to Sinclair et al. (2017), sensory processing difficulties in ASD manifest as hypersensitivity, sensory stimulus avoidance, diminished sensory response, and/or sensory-seeking behavior (p. 236). In this regard, Torres et al. (2021) state that Sensory Processing Disorder (SPD) is a problem that affects more than 90% of the population with ASD through hypersensitivity or hyposensitivity (p. 1).

In the experiences of the interviewees, some individuals diagnosed with ASD presented either hyposensitivity or hypersensitivity to certain environmental factors such as noise, smells, lights, temperature, and colors, among others. In this sense, bright lights, strong odors, noise from furniture or many people talking simultaneously, and dirty or poorly maintained implements affected adaptive responses.

Hyposensitivity is expressed as indifference to sensations such as pain; in contrast, hypersensitivity relates to demonstrating heightened sensitivity to certain environmental sensations. Wing (1998) states that some children do not like the feeling of clothing, especially socks, and shoes (p. 64), or may exhibit hypersensitivity to touch regarding caresses and hugs (Frith, 2008), as well as to the perception of smells, tastes, lights, among others. According to Güçlü et al. (2007), many children with ASD have unusual reactions to certain sensory stimuli. These reactions vary along a continuum from hyper to hypo-response (p. 21).

Grandin and Panek (2013) affirm that sensory hypersensitivity is completely debilitating for some people and mild for others. Sensory problems can make it impossible for some people with autism to participate in normal family activities, let alone hold a job (p. 5).

There are three sensory patterns traditionally present in individuals with ASD: hyporeactivity, hyperreactivity, and sensory seeking; a fourth pattern known as "enhanced perception" is also proposed (Posar & Visconti, 2018). When these conditions occur in a learning environment, having a record of sounds or noises that may cause disturbance, as well as pleasant stimuli is suggested (Tárraga et al., 2019).

In summary, there are factors that, due to the sensory particularities of individuals with ASD, depending on the case, may cause confusion, expressions of stress, varying states of alertness, affect concentration, and, therefore, impact academic outcomes (González & Ruiz, 2021). Consequently, when designing a learning environment, having knowledge about sensory patterns, as well as the hyposensitivity or hypersensitivity present in the individual with ASD toward perceived environmental stimuli is necessary.

Learning Environments and Cognitive Profile

Regarding the cognitive profile and attentional characteristics of individuals with ASD, Seijas (2015) states that the performance of children with ASD in tests reveals difficulties in shifting attention between stimuli or tasks, a preference for objects over faces, and underdevelopment of joint attention (p. 581). Fernández and Onandia (2022) propose that the cognitive functioning of individuals with ASD differs significantly from those with "typical development." These specific alterations manifest in certain subdomains and cognitive processes, particularly related to how they process information, which, in turn, affects other areas and domains such as attention, memory, executive functions, language, and social cognition (Seijas, 2015; Fernández & Onandia, 2022).

Pérez and Martínez (2014) emphasize how individuals with ASD perceive their reality, process information, and utilize memory, among other factors. This needs an understanding of personality traits, considering that while there are general characteristics of ASD, these may differ in diagnoses of "High-Functioning Autism" and "Asperger's Syndrome."

Interviewed social actors mentioned the close relationship that should exist between the characteristics of a suitable learning environment design and the cognitive profile of the individual with ASD. They also expressed the need for prior knowledge of the individual and their diagnosis in terms of attention, memory, executive functions, time, places, and stimuli, among others; this would allow for a more pleasant environment and greater self-regulation in learning.

From their experiences, one mentioned not starting from a pre-designed model; in the sense of first getting to know the individual, their cognitive profile, and the requested supports. In this process, beginning with observation to identify "primary learning styles" is suggested (Schneider, 2018).

In this regard, some interviewees resorted to different strategies that included a more detailed knowledge of the individual before the start of classes. These strategies varied according to academic training, classroom experiences, and length of experience with these populations. In some narratives, acceptance, respect, and recognition within the group were also mentioned as factors which can significantly influence adaptation processes.

Sharma and Rangarajan (2019) suggest combining different learning strategies to have various perspectives, as part of an eclectic approach in teaching and assessment processes.

Process-based Learning

Among the narrated experiences, "process-based learning" was mentioned. In this regard, it is worth highlighting the experience of the TEACCH Division (Treatment and Education of Autistic and Related Communication Handicapped Children), which proposes structured learning that includes various techniques with an emphasis on social and communication skills that the individual acquires throughout life, where family involvement is fundamental and considered throughout the training process (Hume, 2018, 2020).

Progressive Collaboration

Some individuals with ASD have difficulties with written communication, low muscle tone, and/or dysgraphia (Mayes et al., 2019). In the narratives, one teacher used collaborative learning as a support strategy for students with ASD to overcome certain barriers that had been identified. In this regard, the teachers emphasized the need for receiving approval from the student with ASD and that the student is supported by another person, gradually increasing the number of accompanying individuals.

Information Representation

Many individuals with ASD are visual thinkers (Grandin, 2006; Bled, et al., 2021). In this respect, Grandin (2006), from his lived experience as a person with ASD, states:

> I think in pictures. Words are like a second language to me. I translate both spoken and written words into full-color movies, complete with sound, which run like a VCR tape in my head. When somebody speaks to me, his words are instantly translated into pictures (p. 17).

Thus, in classes, some social actors used images, pictograms, and other visual resources for learning. Similarly, one mother used drawing as a communication strategy with her son. Regarding this, Grandin and Panek (2013) state that understanding what type of thinker someone is can help you respect their limitations and, equally important, leverage their strengths (p. 5).

When designing learning environments for individuals with ASD, contrasting formal theory with documented experiences, using Augmentative and Alternative Communication (AAC) with both external supports (pictograms, images, etc.) or without external supports (gestures, signs, etc.) is recommended (Benítez & Belda, 2022).

Allen et al. (2009) and Quintin et al. (2013) emphasize the importance of music in facilitating communication; likewise, it becomes a support in the development of intersubjective relationships, sustained attention, and/or non-verbal communication, mood, emotions, and affective states in individuals with ASD (Allen et al., 2009). Some interviewees highlighted these possibilities where, on certain occasions, they used music to approach academic content or, in other cases, it became a support to capture attention.

In the current literature, the implementation of Universal Design for Learning (UDL) is suggested as a support for multiple forms of information representation, engagement, action, and expressions of learning, as elements that consider diversity in the classroom (Blanco et al., 2016; Alba, 2019; Puente, 2022). Among other adaptations, auditory devices are part of these communication possibilities.

Recording Experiences

One of the teachers interviewed described how, despite lacking the necessary training for the educational approach to students with ASD, he recorded all his experiences in what he called "fieldwork" to obtain information about the students, both inside and outside the classroom. This strategy allows for greater understanding and trust with the target population since, as interaction becomes more consistent, the observer ceases to be seen as a stranger (Restrepo, 2018).

Based on these inquiries, the teacher gathered inputs to design increasingly relevant strategies and, through participant observations, he analyzed the relationships within the groups to identify, for instance, who they related to more, who they excluded, and who was more extroverted or introverted, among other qualities and skills.

Setting Adapted Goals

Among curricular adaptations, Sánchez (2016) highlights three types of objectives based on brain networks: "affective (affective networks), cognitive (recognition networks), and procedural (strategic networks)" (p. 68) objectives that should be considered in terms of learning and coherence with the dominant network.

From the perspective of social actors, mothers emphasized that learning objectives were adapted to the particular needs of their children according to their strengths and learning styles. They provided support from home and requested assistance from educational institutions.

According to Sánchez (2016), learning objectives or challenges should be progressive and "should be proposed up to where the child's cognitive ability allows them to advance" (p. 63); meanwhile, individual characteristics should be considered when projecting their scope. Furthermore, parents or guardians of individuals with ASD are encouraged to participate in the evaluation of the proposed objectives. In this regard, González et al. (2016) stress the need for an evaluation they call "multi-informant," which allows for contrasting the information obtained with the performance contexts.

Formal Education or Homeschooling?

Among the narratives, "homeschooling" was mentioned as an educational alternative for individuals with ASD, along with the necessary adaptations to the formal curriculum. They suggest that these should be "personalized" according to the necessary skills, potentialities, and requirements. Some social actors expressed controversies regarding enrollment in the formal system, particularly for individuals at level 3 on the DSM-5 scale ("requiring very substantial support"). For this and other reasons, constructing an adapted curriculum jointly, between the family, the educational institution, therapists, and related professionals was necessary.

Among the requested supports, in several cases, the figure of the "shadow therapist" or "shadow teacher" was highlighted concerning the educational and/or formative support provided both at home and within the formal institution.

Conclusions

Based on the stated objectives, the following conclusions are drawn:

As far as the first objective is concerned, "to understand the lived experiences of four educational social actors (teacher, family or guardians, expert, and individual with ASD) regarding learning environments for individuals with ASD," the narratives revealed several elements related to planning and appropriate designs. According to the expressed views, considering their particularities and clinical diagnosis was necessary. They also mentioned the arrangement of spaces, distribution of students, content or thematic axes, locative resources, materials, human resources, curricular adaptations, and specific or disciplinary didactics, among other aspects. In the same line of thought, they emphasized prior dialogue with students about their preferences, learning styles, and inquiries into their cognitive profile through various sources of information (family, teachers, experts). Some of the strategies mentioned included inquiries and observations during classes to determine resources, strategies, and adaptations toward the acquisition of learning and socio-emotional skills.

The second objective, "to compare common and different experiences through units of meaning related to the learning environments of individuals with ASD," allowed for an understanding that a common experience among the social actors was the development of a bond and empathy toward the person with ASD. Such an understanding involved, among other aspects, getting to know them, listening to them, understanding them, and learning from them; in the words of one of the social actors, "humanizing" them, beyond a clinical diagnosis or being seen as "a patient".

This stems from a commitment by the social actors involved to acquire greater knowledge about ASD, to understand its particularities, potential, and differences, moving beyond a deficit-focused approach. In this regard, they agree that educational institutions and teachers should be prepared to recognize that each student presents a "spectrum," which is perceived through their different ways of feeling, learning, and communicating.

Regarding the third objective, "to interpret the meanings and divergences in how the phenomenon was experienced based on the lived experiences of the social actors," the interpretation of the experiences highlights the importance of prior knowledge about the teaching and learning processes of people with ASD. This includes, among other aspects, the didactics of specific knowledge, the cognitive profile and learning styles, as well as identifying those elements of the environment that favor sensory processing or integration, the balance between hyper or hyposensitivity, visual and auditory aids, language and communication

strategies (verbal and non-verbal), knowledge of their clinical diagnosis, initial contact, and social skills.

However, when designing collaborative work strategies, the consent of the individual or student should be obtained for the development of activities, where support and evaluation are suggested.

Finally, the importance of formal education and homeschooling is emphasized through a joint effort between the family or guardians, caregivers, teachers, and other professionals involved in creating an appropriate environment for facilitating the learning process of this population.

Study Limitations

One of the factors identified as limitations in the understanding of the phenomenon of ASD is the scarce narrative about experiences of individuals with this condition. This is due to the fact that during this study it was possible to interview only one of them. Additionally, there is a lack of information and research on ASD and gender perspectives, considering the increase of women with late diagnosis.

Another factor is related to the time required to conduct the interviews and the availability of participants, as being a phenomenological study. To conduct in - depth interviews is suggested and this entails a high number of meetings which brings time constraints.

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