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ORIGINAL

Perception and feelings of children with ASD in relation to clothing

Percepción y sensaciones de niños con TEA con relación a la indumentaria

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ABSTRACT

The purpose of this research is knowing how children from 6 to 13 years with Autism Spectrum Disorder (ASD) perceive and react to certain stimuli in relation to clothing. ASD is a neurodevelopmental disorder characterized by restricted and repetitive behaviors, as well as deficiencies in communication and social interaction. In recent years, the sensory disorder has taken on importance as one of the main factors in ASD, thus recognized by DSM-V in 2013 as part of the diagnosis. The study had an exploratory scope with a qualitative approach, analyzing two perspectives: on the one hand, the one of parents of children with ASD in the province of Córdoba and, on the other hand, the one of health professionals. Therefore, it was analyzed how different clothing factors, such as color, texture, sound, odors, among others, affect to the senses and in which way they are perceived. The results showed that sensory disorder varies from child to child, since it is a spectrum that ranges from hypersensitivity to hyposensitivity. In addition, it was found that a stimulus can cause three states to the child: fascination, rejection or indifference.

Keywords: Autism Spectrum Disorder; Sensory Perceptual; Sensory Sensitivity; Inclusive Clothing.

RESUMEN

La finalidad de la presente investigación es conocer de qué manera los niños de 6 a 13 años con Trastorno del Espectro Autista (TEA) perciben y reaccionan ante determinados estímulos con relación a la indumentaria. El TEA es un trastorno del neurodesarrollo que se caracteriza por comportamientos restringidos y repetitivos, así como por deficiencias en la comunicación e interacción social. En los últimos años, tomó relevancia el trastorno sensorial como uno de los factores principales en el TEA, reconocido así por el DSM-V en 2013 como parte del diagnóstico. El estudio tuvo un alcance exploratorio con enfoque cualitativo, analizando dos perspectivas: por un lado, la de los padres de niños con TEA de la provincia de Córdoba y, por el otro, la de profesionales de la salud. Así pues, se analizó cómo distintos factores de la indumentaria, tales como el color, la textura, el sonido, los olores, entre otros, inciden en los sentidos y de qué manera son percibidos. Los resultados arrojaron que el trastorno sensorial varía de niño a niño, ya que se trata de un espectro que va desde la hipersensibilidad, hasta la hiposensibilidad. Además, se halló que un estímulo puede causar al niño tres estados: fascinación, rechazo o indiferencia.

Palabras clave: Trastorno del Espectro Autista; Percepción Sensorial; Sensibilidad Sensorial; Indumentaria Inclusiva.

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by impairments in communication, rigid thinking, and sensory processing peculiarities. The latter, currently recognized as

diagnostic criteria in the DSM-5, encompass both hypersensitivity and hyposensitivity, which affect how individuals perceive, process, and respond to environmental stimuli. In this sense, clothing, as an everyday item in direct contact with the body, becomes a relevant factor in understanding the sensory experiences of children with ASD.

Various studies indicate that perceptual-sensory problems are one of the most significant aspects of this disorder, as they directly affect children's interaction with their physical and social environment. Thus, stimuli related to the color, texture, sound, or even smell of a garment can elicit responses ranging from pleasure and tranquility to discomfort and outright rejection. Consequently, clothing not only serves a practical function of protection and warmth, but also acts as a mediator between the child's sensory experience and their emotional and behavioral well-being.

Although there is theoretical evidence highlighting the importance of sensory factors in people with ASD, there is still a need for applied research to understand how these alterations manifest themselves in specific, everyday contexts. In this context, the design of clothing adapted to the perceptual needs of children with autism is emerging as a growing interdisciplinary field of study, integrating contributions from neurology, psychology, occupational therapy, and design.

The present research was conceived as an exploratory qualitative study aimed at identifying the sensory perceptual factors associated with clothing in children with ASD between the ages of 6 and 13. To this end, two complementary groups were involved: on the one hand, families of diagnosed children, who contributed their experience and observations regarding their children's reactions to different sensory stimuli; and on the other, a specialist in pediatric neurology, whose perspective allowed for a deeper clinical understanding of the disorder and its relationship to sensory perception.

In summary, the purpose of this work is to highlight how stimuli related to clothing influence the daily lives of children with ASD, demonstrating the need to consider these particularities in clothing design. In this way, it seeks to provide a basis for future research that will expand knowledge on the subject and promote innovative solutions aimed at inclusion and well-being.

How do perceptual-sensory factors influence the relationship between children with Autism Spectrum Disorder (ASD) and clothing?

Objective

To understand how children with Autism Spectrum Disorder (ASD) aged 6 to 13 perceive and react to certain stimuli in relation to clothing.

METHOD

Design

This exploratory research used a qualitative approach to understand the perceptual-sensory factors related to elements of clothing. A non-experimental cross-sectional design was adopted, using interviews conducted between September and October 2021.

Participants

This research addressed the study of two population groups, which allowed the issue to be approached from different perspectives.

On the one hand, families with children aged 6 to 13 with Autism Spectrum Disorder (ASD) contributed their experiences and observations. The sampling of this population was carried out using intentional non-probabilistic criteria, and five families with children with ASD, aged between 6 and 13, from the province of Córdoba were selected. Therefore, as the sample involved minors, family members received a consent form, which they had to sign to demonstrate their approval.

On the other hand, the second group consisted of health professionals. Therefore, Valeria Daniele, a doctor specializing in pediatric neurology, participated. It should be noted that her opinion is extremely important, as this is a neurodevelopmental disorder. Sampling of this population was carried out using non-probabilistic intentional criteria.

Instruments

To gather the information, interviews were used to discuss the child's relationship with clothing. These were conducted with the child's parents in person and by video call, with a recorder to transcribe them later. The interview with the doctor was also conducted by video call, using a recorder.

Data analysis

To proceed with data collection, the interviews were first transcribed. Then, a general reading was carried out to continue with an analysis of the relevant information to be included. Finally, comparative tables were

generated based on the variables.

Therefore, the data analysis that was intended to be collected from the technique used with parents is to reveal the sensory perceptual elements of each child with ASD in relation to clothing. That is why it was based on the following variables:

- Visual: Questions were asked about the factors that make up color, such as intensity, preferred colors, rejected colors, and visual elements of the garment.
- Tactile: This variable addressed reactions to textures, preferred and disliked types of fabrics, and clothing weight.
- Olfactory: Information was gathered about reactions to citrus scents, which ones they find fascinating or relaxing, and which ones they reject.
- Auditory: This section dealt with tolerance of the sound produced by textile accessories, including zippers, Velcro, snaps, and clasps. In addition, the sound of friction between textiles was discussed.

On the other hand, the results of the interview with the doctor were intended to understand the disorder, how it affects the child's perceptual-sensory abilities, and, finally, to understand how clothing can help. To this end, the following variables were used:

- ASD: Questions were asked about what the disorder involves and the factors that make up the diagnosis.
- Sensory perception in children with ASD: Within this variable, information was collected about what sensory perception involves, hyper- and hyposensitivity and their detection, how it affects the child, and how sensory perception problems are addressed.
- Perceptual factors associated with clothing: The purpose of this section was to investigate how clothing can affect children and, in turn, how it can contribute to their well-being.

RESULTS AND DISCUSSION

Below, we detail the information gathered in the interviews with parents on the one hand, and the results obtained from the interview with the health professional on the other.

Analysis of interviews with a sample of parents

The following diagnoses stood out among the interviewees: Pervasive Developmental Disorders (PDD), Childhood Autism, and Autism.

In addition, a survey was conducted on which senses were affected at both the hyposensitive and hypersensitive levels. Most participants said they did not know if their child was hyposensitive in any sense. However, participant 3 acknowledged that their child was auditory hyposensitive. Participant 5 also stated that their child has a lack of tactile sensitivity, so they constantly need pressure and to explore different textures. In addition, their vestibular and proprioceptive senses are affected, so they walk on tiptoes.

With regard to hypersensitivity, recognition was higher. Participant 2 highlighted auditory and olfactory hypersensitivity; participant 3, tactile hypersensitivity; participant 4, olfactory hypersensitivity; and participant 5 stated that it was probably olfactory hypersensitivity. Participant 1 stated that they did not recognize which senses might be affected.

The different tables below show how factors related to clothing influence the senses.

Table 1 shows how color affects children and what factors are necessary to get their attention.

Table 1. Visual factors related to clothing

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
What is your favorite color?	I don't have a favorite color; they're all the same to me.	Blue and yellow in the sun.	I don't know, since he can't speak or express himself, it's hard to tell.	Black, everything has to be that color, whether it's clothes, toys, or food.	He prefers neutral colors like black, white, and gray. Also French blue.
What colors does he dislike?	He finds colors indistinct and uses any color.	There is no specific color he dislikes.	He is selective about food; for example, he does not like reds and greens. He has no problem with clothes or toys.	I don't think so. In fact, he always chooses the colors he likes.	Yellow and orange. It's very difficult to get him to wear clothes in those colors. I think he rejects bright colors in general.
Does he show a preference for intense colors or more pastel/light colors?	Probably intense colors, although he usually wears neutral tones.	He prefers intense colors.	He prefers light colors.	He is indifferent.	I think they prefer neutral or dark colors.

Have you ever refused to wear an item of clothing because of its color?	No, never.	Not because of the color.	Not because of the color.	Always. The reason is that he wants to wear all black, so it's difficult for him to wear his school uniform, for example, or clothes in other colors.	Yes, T-shirts or costumes in yellow or orange.
What should a garment have visually to appeal to him attention?	Colors and patterns.	It has to have pictures of something he likes.	I don't notice that he has any preferences.	Prints of real dinosaurs or clothes that are the ones used by young people.	Neutral colors or prints of something he likes.

Table 2 shows how textiles, textures, and the garment itself affect the sense of touch and how this varies depending on the child.

Table 2. Tactile factors in relation to clothing

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Have you ever not wanted to wear an item of clothing because of its texture?	Probably jeans. He wears them if you tell him to, but it's not something that makes him feel good.	Not because of the texture of the fabric, but because of the studs, zippers, or other metal parts. Even the label.	Yes, especially clothes that touch his neck.	I haven't noticed him having a problem with that, although it did happen with the labels.	Yes, jeans.
Has anyone ever Discomfort due to the fabric caused he never wear a garment?	Yes, jeans, because they're tight or the fabric is stiff. Cold materials also bother her.	I think it has more to do with the accessories that come with the garment, which is why she wouldn't want to wear it again. But rough or stiff fabrics could probably cause it.	Yes, because of labels, sneakers, or garments with embroidered prints.	Yes, it happens a lot with sneakers; he says they pinch or are too tight. Also with sandals, he said they hurt him.	Yes, sneakers.
Is it entertain themselves touching the texture of the garments?	Yes, he likes it touching ring, the seams. Also the plush.	Yes, he likes feel the textures of the garments. The fleece is the one she likes best.	No, he avoids them.	Yes, he the softness loves, I even relaxes. Also T-shirts with sequins.	Yes, he loves it. It's experiencing much with the touch. Always she is constantly searching for textures.

In addition, cotton is the fabric chosen by the participants, and they all agreed that they prefer fabrics that are softer to the touch.

With regard to weighted clothing, only participant 5 stated that their child needs it. They use adjustable bandages, a vest, and weights. They also explained that its use is limited to therapy and that it would be very helpful to incorporate it into everyday clothing, as they noticed that when their child wears it, they appear calm and focused, and therefore it helps them to settle down. This information can be viewed in more detail in the appendix on pages 65, 66, and 67.

Table 3 contains questions related to the sense of smell, allowing us to differentiate how it affects each child according to their degree of hypo/hypersensitivity.

Table 3. Olfactory factors in relation to clothing

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Is there a particular scent that you notice relaxes him?	I haven't noticed any scent that relaxes him.	Yes, the ones closest to home. For example, the smell of my perfume, his, or the ones we use at home.	I haven't noticed any scent having that effect on him.	I haven't noticed any scent that relaxes him.	I couldn't say for sure. Although he is always exploring smells.

Is there a scent he has a preference for?	No, I think he's indifferent to smells.	I don't know if it's a favorite, but there is a smell that reminds him most of home.	I don't think so, it's hard to know because he doesn't talk, so it's difficult to tell.	Yes, for lavender.	No, in general, he dislikes smells.
Is there any smell bother you?	Yes, the smell of Smoke or burning.	Yes, many. This is because you perceive smells that one does not normally perceive.	I don't think so.	Yes, in especially the smell of fish.	Yes, many, to Due to your hypersensitivity, you may even reject smells that are normally pleasant to most people.

Finally, we investigated how the sound of equipment influences children. The results depend on the degree of sensitivity of each child, as can be seen in Table 4.

Table 4. Auditory factors related to clothing

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Have you ever didn't want to wear a garment to cause of supplies that did I have?	No, in general he I buy other types of close but due to issues of practicality.	Yes, jeans and the jackets. Everything that can make noise and it's metal does not wants.	Yes, because example, to the vests was held sew, because he didn't like the type close. They don't like clothes that have zippers or buttons.	No, never had problem with that.	Yes, because example, in costumes that were with hook and eye closure has rejected always.
Does it bother you the sound of the close when go up and down?	No, they don't problem.	Yes, especially when they are metal.	I think No, I'm sorry. that the problem It's in the texture and it makes it feel uncomfortable.	I think Yes, because always shouts when I go up the zipper. It bothers me in jackets but not in jeans.	In that I haven't noticed that he bother me.
Do you wear clothes with Velcro? Does the sound when it comes off bother you?	I rarely wear them, but no.	Yes, even where I go for therapy, they use Velcro a lot. But the sound doesn't bother him.	I wear Velcro sneakers and the sound doesn't bother me.	Yes, but he has no problem. He even enjoys sticking it on and taking it off.	No, he even likes sticking and unsticking the Velcro; he enjoys doing it.
What about the noise of the ends of jacket/sweatshirt drawstrings bumping together?	It doesn't bother him. He even sometimes entertains himself by putting the ends between his palms to make noise.	Yes, he always removes the drawstrings from sweatshirts or jackets.	Yes, it bothers him. He always takes them off.	Yes, although when they are higher up, he has no problem with them. But if they're very long, he always tends to want to pull them off.	No, I haven't noticed that it bothers him. I feel like he's entertained by it.
Does he wear clothes with snaps? Does the sound of fastening and unfastening bother him?	Yes, it doesn't bother him.	Yes, a little. Those make less noise, so they don't bother him as much.	He doesn't wear them, so I don't know if they bother him. He always prefers clothes that don't have anything on them.	Not currently. He used to wear snaps on his shoulders because he had trouble getting his head through. I had to find other options because the noise bothered him.	He used them when he was younger and noticed that the snaps on shirts bothered him.
Does friction or rubbing between fabrics bother him?	No, he has no problem with that.	I haven't noticed that it bothers him or causes him any discomfort.	Yes, it bothers him. He doesn't want to wear puffy jackets or raincoats.	No, it doesn't bother him.	I haven't noticed that it bothers him.

Analysis of interview with pediatric neurologist

Within the ASD variable, it was found that this is a neurodevelopmental disorder consisting of three aspects.

The first is communication, which is evident when verbally addressing the child and he does not respond. Therefore, this does not mean that the child cannot speak, but rather that he has no communicative intention. The second is rigid thinking, which can be observed when, for example, a child with ASD plays with animals and, instead of doing so like a child without ASD, he lines them up or classifies them. This can also be observed in the child's obsessive behaviors, such as having the door closed or things arranged in a certain way, among others. The third is sensory disorder, which ranges from hypersensitivity to hyposensitivity, which is not always taken into account and is one of the factors that most affects the child. In addition, the doctor states that in 90 % of cases there is a sensory disorder and that the remaining 10 % is due to no one detecting it.

With regard to the variable sensory perception in children with ASD, it was found that the same child can be hypersensitive, hyposensitive, or both. In cases where both are found, which is in the majority, they are hypersensitive at certain times and hyposensitive at others.

In addition, it was found that this sensory disorder changes and normalizes over the years, so that the younger the child, the greater the sensory problems.

On the other hand, the reason why the same stimulus affects some children and not others is because each person is different. Consequently, the effect of the stimulus on each child is different. For example, the rejection of a food may be due to its texture, color, taste, or other factors.

Finally, these sensory disorders are treated with early stimulation or occupational therapy. The aim is to desensitize the sense so that it no longer produces a certain sensation. In addition, in hyposensitive cases that require constant stimulation, pressure is applied through tight clothing or weighted blankets.

Regarding the variable of perceptual factors associated with clothing, it was found that, on the one hand, people with hypersensitivity do not respond well to flashy items, so the fewer stimuli they have, the better. In addition, clothing should be as loose-fitting as possible, made of lightweight fabrics that are soft to the touch, in order to minimize contact with the skin. In general, they are more sensitive in the lower body than in the upper body, which is one of the reasons why shoes, socks, or pants often cause discomfort. They also have a lot of sensitivity in the head.

On the other hand, in cases of hyposensitivity, fabrics should be stretchy and tight-fitting to generate pressure and make the child feel contained.

In both cases, labels and internal seams cause discomfort and should therefore be avoided or kept to a minimum.

It should be noted that these differences between hypersensitive and hyposensitive individuals highlight the need to detect them in order to know which garments are appropriate for each case.

DISCUSSION

This research sought to understand how children with Autism Spectrum Disorder (ASD) perceived and reacted to certain stimuli in relation to clothing.

It was found that, in most of the cases studied, there are certain perceptual-sensory problems. These results confirm what was expected and are in line with the findings of previous studies. Therefore, it can be observed that unusual responses to sensory stimuli have been described since the beginning of the official history of autism. Both Kanner and Asperger,[1] encountered strange responses from their patients with regard to sounds, touch, smells, visual stimuli, and taste.[2] For his part, Delacato in 1974 attributed autism to a brain injury that affected one or more sensory channels, leading the autistic child to perceive environmental stimuli differently. In addition, the author considered these unusual sensory experiences as primary characteristics of autism.[2] We can also find this assertion in autobiographical accounts of people with autism who consider the disorder to be a condition directly related to sensory processing, suggesting that the cause of social and communication problems is sensory-perceptual in nature.[2] Likewise, in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), sensory alterations were recognized as one of the diagnostic criteria for ASD.[3] Finally, according to the expert in pediatric neurology, 90 % of cases involve a sensory disorder, and the remaining 10 % are due to a lack of detection.

On the other hand, the statement made by Ayres et al.[4] confirmed, in which they express that children with autism represent a heterogeneous group with certain symptoms in common, such as sensory impairment, which can vary from child to child. Therefore, in relation to this, it was observed that the senses affected at both the hypersensitive and hyposensitive levels depend on the individual.

Furthermore, this research was unable to determine exactly whether these perceptual-sensory differences are directly related to the child's diagnosis or whether their causes depend on other variables. However, Ferreira de Souza et al.[3] state that the severity of sensory symptoms in people with ASD varies according to the severity of the disorder and chronological age. Regarding the latter, the expert states that the younger the age, the greater the sensory disorder.

In relation to hyper- and hyposensitivity, it is noteworthy that, in most cases, hyposensitive senses are not recognized, in contrast to hypersensitive senses, which are. However, it can be observed that throughout the

interview, certain hypersensitive and hyposensitive senses were detected that the parents did not initially recognize and that, upon becoming aware of certain situations, led them to think that these discomforts or pleasures may be due to a sensory disorder. For her part, the pediatric neurologist added that there are more children with hypersensitivity than with hyposensitivity. In addition, the same child can be both hypersensitive and hyposensitive, so that at different times one or the other may manifest itself.

Among the cases, it was found that the senses most affected are touch, hearing, and smell, which is partly consistent with the findings of Kern et al., who suggest that the main sensory modalities affected are hearing, vision, touch, and taste.[2] This may be because in many cases the alteration is not visible.

Moving on to the senses in relation to clothing, we first refer to the results concerning vision. With regard to colors, three groups can be distinguished. On the one hand, there are children who are indifferent to color or whose speech and hearing difficulties prevent them from expressing it. On the other hand, there are children who show a preference or obsession with a specific color. Finally, there are children who only show rejection and discomfort with certain colors. Therefore, Coulter[5] offers some explanations for these results in her research. This author highlights that one of the reasons lies in differences in the structures of the central nervous system, where the individual's neurological system may be hypersensitive or hyposensitive to a wide range of stimuli. Consequently, their neurological system, as well as their temperament and learning style, interact and influence how the child reacts and responds to sensations and how they regulate and understand sensory information. In addition, she highlights that visual differences include hypersensitivity and hyposensitivity, photosensitivity, color perception, and central processing, among others. Finally, she adds that among the visual symptoms associated with ASD is the preference for or avoidance of a particular color. For her part, the neurologist offers her perspective, asserting that this has to do with the connection between sensory perception and rigidity of thought.

Among the most popular colors are blue and achromatic colors such as black, white, and gray. Among the rejected colors are yellow and orange, mostly bright colors. This is consistent with research conducted by Grandgeorge et al.[6] who found that children with ASD reject the color yellow because they perceive it as sensory overload and that between the ages of 4 and 17, there is the same preference for blue and green. In addition, brown was preferred between the ages of 4 and 7, and red between the ages of 8 and 17. However, this study has limitations in terms of the colors analyzed, as it does not include achromatic colors, which were considered in the results of the present study.

Additionally, it should be noted that only 2 of the 5 cases reported that the child did not want to wear a garment because of its color, which may be due, as Coulter[5] states, to a factor dependent on visual differences between individuals.

On the other hand, it is observed that, in most cases, for a garment to visually attract the child's attention, it must contain colors and patterns that the child identifies with, such as cartoon characters, animals, among others.

Below are the results regarding tactile aspects in relation to clothing. With regard to the textures of garments, it was found that those that cause the most discomfort are jeans and sneakers. The possible causes may be due to textiles that are rough to the touch and the fit on the skin. From the neurologist's point of view, children with ASD have greater sensitivity in the lower part than in the upper part, which would explain the discomfort caused by socks, pants, and shoes. Similarly, Wing[7] states that some children with ASD dislike the feel of clothing, especially socks and shoes, and that this could be the reason why children take off their clothes as soon as they can. Bogdashina[1] states that some children refuse to wear certain garments because they cannot tolerate the texture against their skin, as their hypertactility results in overwhelming sensations, and even the slightest touch can send them into a panic attack. That is why tactile hypersensitivities must be addressed by choosing clothing and fabrics that the child can tolerate.[1] Additionally, it should be noted that the discomfort caused by labels in most cases is consistent with what Caminha[2] said about individuals with sensory sensitivity being highly perceptive, which can cause them to be bothered by clothing labels and certain fabrics. On the other hand, the discomfort caused by garments with many seams and embroidered patterns must be taken into account. This is in line with the neurologist's statement that seams and labels cause discomfort in both hypersensitive and hyposensitive individuals. However, she maintains that, on the one hand, children with hypersensitivity need loose-fitting, soft-to-the-touch, lightweight garments with as few sensory stimuli as possible. On the other hand, children with hyposensitivity need stretchy, tight-fitting garments that generate pressure.[8,9,10]

Furthermore, with regard to the search for textures, two groups can be distinguished. On the one hand, there are children who are entertained by and find certain textures pleasant, and on the other, there are those who avoid them. This has to do, as authors such as Bogdashina[1] and Wing[7] assert, with hypersensitivity and hyposensitivity, where their behavior towards certain textures is a consequence of seeking to suppress pain and avoid them, on other occasions to awaken the nervous system and obtain sensory stimulation or to provide themselves with internal pleasure.[1] Among the textures that are considered pleasant, plush stands out for its

soft structure.[11,12]

As for weighted clothing, only one of the participants stated that their child uses it in therapy, and said that it helps them to concentrate, orient themselves in space, and achieve calmness in the child. They added that the aim of using weight is to teach the brain the information it is missing and/or has too much of. There is agreement between the participant's statement and Bogdashina.[1] in that it is proprioceptive hyposensitivity that causes difficulties for the child, making it difficult for him to know where his body is in space and sometimes not being aware of his own bodily sensations.[1]

Likewise, the child wears a Lycra suit, which, according to the participant, helps them feel contained and identify the limits of their body, resulting in calm and regulated behavior, and also reducing the child's tendency to walk on tiptoes. Bogdashina[1] explains that the use of tight-fitting garments that apply pressure helps to reduce self-stimulatory behaviors.[13,14,15]

Both weighted clothing and the Lycra bodysuit correspond to deep touch pressure (DTP), which is one of the sensory stimulation treatments used to help people with sensory processing disorder. Occupational therapists recommend the use of compression products to treat this disorder, with the purpose of helping them process sensory signals. In addition, DTP is a type of tactile sensory input that can be produced by touching, stroking, squeezing, holding, hugging, or wrapping tightly, etc. DTP therapeutic interventions modulate physiological and psychological states through proprioceptive input to the central nervous system, calming the individual. Its purpose is to promote the production of neurotransmitters (serotonin , and dopamine) that can provide calming input to the central nervous system.[16]

With regard to smell in relation to clothing, it is recognized that there are three distinct groups among the smells that generate favoritism. On the one hand, there are children who are indifferent to smell or who do not show it. On the other hand, there are children who show favoritism for a specific smell. Finally, there are those who reject any type of smell. On the other hand, among the smells that cause discomfort, two groups can be distinguished. On the one hand, there are children who are bothered by a specific smell and, on the other, there are children who, due to their olfactory hypersensitivity, recognize several smells that cause them discomfort. It should be added that, in one of the cases, the participant states that even those smells considered pleasant are rejected by the child. As Bogdashina[1] explains, some individuals with autism have a sensitive sense of smell similar to that of dogs. Therefore, according to Wing[7] some individuals who are hypersensitive to smells may be bothered even by mild aromas. Furthermore, with regard to odors that relax the child, most were not detected by the participants, except for one participant who stated that his child is relaxed and calmed by odors that remind him of home.[17,18]

Finally, auditory factors related to fasteners and the rubbing of textiles are discussed. With regard to fasteners, there was agreement among participants that the sound of sticking and unsticking Velcro is pleasant and stimulating for children. In one case, the participant stated that Velcro is pleasant to the ear but causes aversion when it comes into contact with the skin. In another case, the participant's child rejects zippers or buttons for the same reasons.[19,20]

In contrast, there are differences in relation to trims that cause discomfort. One of the participants stated that their child is bothered by the sound of metal colliding with other surfaces due to their hyperacusis, which leads them to avoid garments that contain trims made of that material. Regarding the sound of zippers going up and down, only two reported that it caused discomfort, and in one case, the child reacted by screaming. On the other hand, the sound of snaps caused discomfort in only two cases. As for the sound of the locks at the ends of shoelaces, there are two distinct groups: those who find it annoying and those who find the sound pleasant. Finally, only one case reported that the sound of rubbing certain fabrics, such as puffer jackets and raincoats, causes discomfort. The explanation for this is that the same individual may ignore some sounds, be fascinated by others, and be distressed by others.[7] In addition, the same stimulus may cause disturbance in some children but fascination in others.[1]

Among the limitations of the research, it is worth mentioning, first, the small sample size, which limited the scope of the study, as no generalizable results were obtained in a probabilistic sense. However, the objectives have been achieved from a qualitative approach. Secondly, it was not possible to conduct interviews or observations with the children. On the one hand, this was due to their condition and, on the other, because the participants are located in different towns and cities in the province. Therefore, the results are observations and perceptions of the parents. Finally, there was restricted access to bibliographic material, either because it was paid material or because of the author's copyright.[21,22]

However, despite the limitations, a heterogeneous sample was achieved, which allowed comparisons to be made between the results obtained. In turn, the research had two perspectives: on the one hand, that of the parents of children with ASD and, on the other, that of a professional, which enriched the study and provided a better understanding of the issue. Therefore, the objectives set at the beginning of this research were achieved.[23,24,25]

CONCLUSIONS

It was found that perceptual-sensory problems are a common factor among children with ASD, which affects each child differently, so that the same stimulus can be stimulating for some and cause pain and discomfort for others. Therefore, it can affect the senses in a hyper- or hyposensitive manner. In addition, it was found that, in relation to clothing, children can show three states: fascination, indifference, or rejection. It should also be noted that this attitude on the part of the child depends on whether their senses receive a lot or a little information, that is, whether they are hypersensitive or hyposensitive. On the other hand, from a design perspective, these results show that there is diversity among children with ASD in terms of their reaction to stimuli, making it difficult to provide a single answer to the problem. Therefore, an individual approach is required that responds to the needs of each child. However, this research found certain patterns in both hypersensitivity and hyposensitivity, which provide guidance to designers when considering their designs.

From the outset, this final project was intended to be a starting point for future research in different fields, especially in design, where new questions are raised about how this issue affects a larger sample, in order to reach more accurate conclusions. Therefore, it would be interesting to conduct a study that incorporates observation of children, which would allow us to understand the issue firsthand. In addition, it would be worthwhile to investigate how it affects adolescents and adults with ASD and what other problems afflict this age group. On the other hand, considering that ASD is a disorder that has no cure but whose condition can improve through treatment, it is interesting to ask how clothing design can accompany these children through the different stages of their lives and offer them new solutions that contribute to their well-being. Finally, it should be noted that collaborative and interdisciplinary work between designers, psychologists, occupational therapists, neurologists, among others, would contribute to the enrichment of the research.

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