Investigating the Influence of the Properties of School Uniforms on Children With Sensory Overreactivity

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Abstract

This study aimed to deepen the understanding of the influence of the properties of school uniforms that may contribute to discomfort and irritation for children with sensory overreactivity. The specific objectives were (a) to identify the difficulties that children with sensory overreactivity experience when wearing a school uniform and (b) explore possible adaptations of the school uniform that can reduce the discomfort and irritation caused by the uniform. In this exploratory, qualitative study, four focus group interviews were conducted with a total sample of 16 participants. Mothers and occupational therapists that live and work with children with sensory overreactivity participated in this study. During thematic analysis, three themes emerged as important to understand the discomfort caused by a school uniform: textiles, design, and construction. This study contributes to the literature on school uniforms and the sensory aspects of clothing. Guidelines for parents are presented and future research possibilities are discussed.

Keywords

sensory overreactivity, tactile defensiveness, school uniforms, textile comfort, inclusive design

Many children have a low threshold toward sensory input and, as a result, may experience sensory overreactivity (hypersensitivity) to sensory stimuli (Ilić-Savić et al., 2021). Sensory stimuli, also called sensory input, refers to any information received by the senses (taste, touch, hearing, smell, movement, gravity, and position; Ayres & Robbins, 2005). The concept of overreactivity implies an overreaction to sensory stimuli and is also referred to as sensory overresponsiveness, sensory sensitivity, sensory defensiveness, and even hypersensitivity (Bar-Shalita et al., 2009; Dunn, 1997; Roy

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et al., 2018; Shin & Gaines, 2018). Even though many typically developing children struggle with sensory overreactivity, it especially affects children with disorders such as attention deficit hyperactivity disorder (ADHD) and autistic spectrum disorders (ASDs; Ayres & Robbins, 2005; Buckle et al., 2011; van Jaarsveld et al., 2014). The nervous system of a child with sensory overreactivity responds with a "fight" (e.g., tantrums) or "flight" (e.g., withdrawal) reaction when certain stimuli crosses their sensory threshold (Karthikeyan, 2017). Clothing, worn next to the skin, is a regular source of sensory stimuli and may therefore elicit overreactive responses from children with sensory overreactivity, especially due to its tactile properties (Zhou, 2018).

In the majority of South African schools (primary and high schools), children wear school uniforms daily, as is encouraged by the Department of Education (Wilken & Van Aardt, 2012). The average South African school child (5–18 years of age) spends approximately 6 hours per day and 5 days per week at school (Nkosi et al., 2017) while wearing their school uniform. The majority of academic learning takes place while the child wears their uniform (Baumann & Krskova, 2016). If the school uniform contributes to sensory overstimulation and prevents the child from being in a calm and alert state, it may directly affect the child's education (Kyriacou et al., 2023). The sad reality is that children's overreactive behavior is often misinterpreted as aggression or negativity, as their teachers, peers, and parents may not comprehend the battles they face (Christopher, 2019). It is therefore essential to understand which properties of the school uniform may influence sensory overreactivity. This understanding would facilitate attempts to reduce factors contributing to sensory overstimulation and may assist the individual to perform optimally in all of his/her occupational performance areas.

Clothing comfort is based on individual perception and refers to how a textile product interacts with the human body (Kadolph, 2013). For a garment to be considered comfortable, it should encompass sensorial comfort, which describes the feeling of comfort across all sensations during wear (Kaplan & Okur, 2009; Liu & Little, 2009). Clothing comfort while wearing a school uniform is therefore very important and has been found to have a direct influence on academic performance (Bell et al., 2005).

A recent systematic review on the impact of school uniforms on education and health found that the 92 studies under review focussed on aspects such as gender equality, freedom of expression, and school culture (Reidy, 2021). The minority groups that were identified were based on race, gender (including gender-diverse students), religion, and income (Reidy, 2021). Interestingly, the needs of children with disabilities were not identified in any of the studies included in the review. Therefore, a gap exists in the literature concerning children with disabilities and the impact of school uniforms on their education. To date, empirical evidence on the specific properties of clothing, and in particular school uniforms, that may cause sensory overreactivity is not available.

The purpose of this study was to explore and describe the properties of school uniforms that may manifest in sensory overreactive responses in children, irrespective of age. The outcomes of this study were to uncover the specific elements in a typical school uniform that are not sensory-friendly/elicit sensory overreactive responses (Objective 1) and investigate what parents and school uniform designers can do to alleviate the sensory burden of a mandatory school uniform (Objective 2).

Literature Review

Sensory Overreactivity

Sensory integration (SI), first defined and explained by seminal author Jean Ayres (1972), refers to the ability of the brain to filter and organize sensory stimuli to develop specific responses (Asmika et al., 2018; Ilić-Savić et al., 2021). The brain receives sensory information from the senses (taste, touch, sight, hearing smell, movement, gravity, and position) and organizes it unconsciously

(Ayres & Robbins, 2005). Ideally, organized information flows in an arranged and integrative manner, whereby it allows a child to respond purposefully (Ayres & Robbins, 2005). When this process becomes disturbed, the information does not flow in a meaningful manner and the brain, therefore, is unable to respond appropriately or suitably to interpret the stimulus. This is known as sensory integration dysfunction (SID) and is also referred to as sensory processing disorder (SPD; Buckle et al., 2011; Cheng & Boggett-Carsjens, 2005). It is estimated that one in 20 people in the general population may be affected by SID (Kong & Moreno, 2018). Even though people of any age may have SID, it may be particularly problematic in children (Ayres & Robbins, 2005; van Jaarsveld et al., 2014).

A child with poor sensory processing may display either a high threshold or a low threshold for sensory input (Dunn, 2006). A high sensory threshold presents as sensory underreactivity, while a low sensory threshold results in sensory overreactivity (Ayres & Tickle, 1980; Ilić-Savić et al., 2021). In cases where a high threshold to sensory stimuli is displayed, an individual does not easily respond to sensory stimulation, and therefore tends to take longer to respond and/or react to the sensory stimuli. When a child's threshold is low, the individual experiences stimuli more intensely, is more sensitive to sensory stimulation (Cheng & Boggett-Carsjens, 2005; Dunn, 1997), and therefore, has sensory overreactivity.

When sensory overreactivity occurs, the body experiences sensory overload, which results in the inability to maintain self-regulation (Karthikeyan, 2017). An individual's nervous system will perceive this as a state of danger and will respond with "fight" or "flight" reactions. Thus, when a child with sensory reactivity experiences overwhelming stimuli (e.g., a label in a school shirt which constantly creates a painful sensation), their nervous system will respond with "fight" (e.g., tantrums) or "flight" (e.g., withdrawal) reactions due to difficulties in regulating and coping with the challenging situation (Karthikeyan, 2017).

Although many senses are stimulated during the use and wear of garments, the tactile sense plays a major role in eliciting sensory overload in terms of clothing when compared to other senses (Ilić-Savić et al., 2021; Zhou, 2018). Children with sensory overreactivity, specifically tactile defensiveness, can be extremely selective in their clothing options, whereby they may simply refuse or reject an item of clothing due to their intolerance to specific textures or properties of the garment (Kyriacou et al., 2023). This response can become very problematic when introducing school uniforms.

Adapting a child to a sensory overreactivity's environment has been found to reduce disruptive behavior and improve attentiveness (Buckle et al., 2011). When a child's sensory regulation improves, their in-seat behavior, as well as their work speed in class, also improves (Ayres & Robbins, 1979; Buckle et al., 2011; Dunn, 2006). Adaptation of the environment also includes the adaptation of garments (as they stimulate the tactile system), which emphasizes the importance of rethinking garment design and construction, especially for children with SID.

Clothing Properties and Sensory Overreactivity

It is widely recognized that clothing properties can instigate sensory overreactivity (Asmika et al., 2018; Roy et al., 2018). Clothing properties are generally described to include textiles, design, and construction (Shaeffer, 2013). In most cases, this is explained in a more general manner rather than focusing on the specific clothing properties that may contribute to sensory overreactivity. Focusing on fabrication, a recent study by Kyriacou et al. (2023) found that fabric choice indeed influenced sensory overreactivity. Softer fabrics were perceived as more comfortable, as opposed to hard, scratchy, and rough fabrics, which were perceived as uncomfortable (Kyriacou et al., 2023). Specific aspects of clothing that tie back to a design decision are in many cases mentioned incidentally. If clothing is restrictive in areas such as the neck and cuffs, it may increase sensory

overreactivity (Biel & Peske, 2009). A garment with an elastic waistband can cause major discomfort from a sensory point of view and overwhelm a child (Roy et al., 2018).

The specific methods used to construct a garment, in particular the seam class and seam type, can also trigger sensory overstimulation. It is universally acknowledged that seams irritate (Kyriacou et al., 2023; Roy et al., 2018; Shin & Gaines, 2018), but the specific seam types that are the most problematic have not received much attention in research. Flat seams have been acknowledged as a superior option from a sensory point of view (Biel & Peske, 2009). It is assumed that superimposed seams may lead to irritation. Elements such as labeling, sometimes also referred to as tags, are also known for their role in causing irritability during the wear of clothing (Ilić-Savić et al., 2021).

School Uniforms

The implementation of standardized school uniforms aims to draw attention away from learner differences related to status, race, and ethnicity (Reidy, 2021). Furthermore, some believe uniforms increase learner discipline and improve classroom behavior and level of academic performance (Baumann & Krskova, 2016). However, school uniforms that cause sensory irritation have been identified as an obstacle to learning and social participation and can create a negative association with the school (Howe & Stagg, 2016). If the uniform impedes a child's ability to learn, it will not only influence a child's academic achievement but their quality of life and overall well-being (Bertaux et al., 2010; Kyriacou et al., 2023).

When the school uniform consists of standardized garments (e.g., gray trousers and white collared shirts), parents can choose between different clothing retailers and establish which garment options might be the most "sensory-friendly." However, some schools have custom-designed uniforms, which implies that parents are forced to buy school uniforms from private clothing manufacturers. In this situation, garment options are relatively limited. This study, therefore, aims to support parents of children with sensory overreactivity in finding ways to decrease sensory irritations caused by school uniforms. To maintain a manageable scope, outer garments were the focus of the study, and therefore socks and shoes were not considered.

Method

Research Design and Data Collection

The purpose of this exploratory study was to gain a better understanding of the properties of a school uniform that are more prone to culminate in sensory irritation. Since a better understanding of the particular phenomenon was envisaged, and because there is a dearth of research on the topic, a qualitative research approach was chosen, with focus group interviews as the data collection method (Kumar, 2019). Focus group interviews were chosen specifically because this method tends to widen the range of responses, as participants build on each other's ideas and forgotten ideas are often activated (Niewenhuis, 2019). The strategy of inquiry was phenomenological because the views of different participants (based on their experience of children living with sensory overreactivity having to wear a school uniform) were used to better understand the research problem (Niewenhuis, 2019). The research paradigm that underpins this study was constructivism, which posits that reality is socially constructed (Creswell, 2014). In line with constructivism, the researchers hoped to gain a better understanding of the research problem by relying as much as possible on the perceptions and views of the participants (Creswell, 2014). Purposive sampling, which is a non-probability sampling method, was used (Kumar, 2019).

The unit of analysis in this study was very specific and included parents with children that experience sensory overreactivity and are required to wear school uniforms, occupational therapists (OTs)

that regularly treat children with sensory overreactivity that wear school uniforms, and teachers at special needs schools where uniforms are worn. As these individuals live or work with children with sensory reactivity daily, it was assumed that they would be able to explain and discuss the phenomenon of interest based on their own experiences.

Due to the COVID-19 pandemic, the focus group interviews were held virtually. Children with sensory reactivity themselves were excluded from this study to create a virtual focus group environment where adults could freely express themselves. The virtual format assisted in the recruitment of participants since participants from all over South Africa were able to take part in this study. An invitation to be part of this study was distributed via social media, WhatsApp, and email. The researchers searched for OTs that specialize in SI on the Internet. An invitation to take part in the study was sent to them to either participate themselves or to forward the recruitment letter to parents that were eligible to participate. A sample pack that contained swatches of different seam types and fabrics used for school uniforms was couriered to each participant before the focus groups. The participants received a consent letter explaining the nature of the study, which they were asked to complete and send back to the research team before they participated.

In total, four focus group discussions were conducted. With each focus group, fewer people eventually joined than initially agreed to participate. The final cumulative sample of all four focus groups was 16 participants (see Table 1). The small sample is justified by the niche unit of analysis and the exploratory nature of the study. Data collection began once ethical clearance was obtained from the researchers' university. Data were gathered from July 2021 until August 2022, since the first two focus group discussions were coded and analyzed before the next series of focus group discussions started. During the analysis of the first two focus group interviews, the research team realized that data saturation had not occurred as yet and some questions were not fully answered. To enhance

Table 1. Description of Participants.

P	Focus group	Role	Gender of child	Age of child	Special needs of child
1	A	Parent	Male	7	SPD, ADHD
2	A	OT and parent	Female	10	SPD, developmental delays
			Male	12	SPD
			Female	14	SPD, ASD, anxiety
3	A	Parent	Female	8	SPD
4	A	OT and parent	Male	11	Tactile defensiveness
5	A	OT			
6	A	Parent	Male	14	SPD, ASD
7	B	Teacher: special needs school			
8	B	OT and parent	Female	6	Sensory difficulties, ADHD
9	B	Sensory integration OT			
10	B	Parent	Male	14	SPD, autism, familial dysautonomia
11	C	Parent	Female	7	SPD, Tourette Syndrome
12	C	Parent	Female	9	Sensory processing challenges
13	C	Parent	Male	19	SPD, developmental delays
14	C	Parent	Female	9	SPD, Tourette Syndrome
15	D	Parent	Female	12	Sensory sensitivity, ADHD
16	D	Parent	Male	9	SPD, ASD

Note. OT = occupational therapist; SPD = sensory processing disorder; ADHD = attention deficit hyperactivity disorder; ASD = autistic spectrum disorder.

the trustworthiness of the data, it was decided to conduct a second series of focus group interviews. After two additional focus group interviews, data saturation was reached. The data collection and data analysis processes were therefore nonlinear (iterative) since the processes continued until data saturation was achieved and no new aspects emerged (Niewenhuis, 2019). At least two researchers from the research team were present during each focus group. One of the researchers acted as the moderator during the focus group, while the other managed the recordings and assisted if a technical or connectivity problem arose.

Description of Participants

Table 1 provides a breakdown of the profile of the participants. The sample consisted of one teacher that works at a school for children with special needs and five OTs, of which one was a therapist with an additional qualification in SI. Three of the OTs were also parents of children with sensory overreactivity, therefore, in total, 13 of the 16 participants were parents of children with sensory overreactivity. The gender of the children was almost equally distributed. The majority of participants had primary school children, and one parent had a 19-year-old son. Even though the child was not a minor during the time of data collection, the valuable insights the parent shared made an important contribution to understanding the topic and were therefore retained. The sample included parents with children diagnosed with several conditions, including SPD, ADHD, ASD, and Tourette syndrome. Sensory overreactivity is more prevalent in children with these disorders than in the typically developing population (Shin et al., 2015). One participant had more than one child with sensory overreactivity.

Data Analysis

The learning management system Blackboard Learn was used to host the virtual focus groups. With the permission of the participants, the interviews were recorded. Ten questions were formulated after a thorough literature review was conducted. The research team consisted of OTs and academics specializing in clothing and textiles. The interdisciplinary composition of the research team was beneficial in structuring the questions. Table 2 lists all questions posed during the focus group discussion.

Table 2. Focus Group Questionnaire.

Nr	Question
1	Please tell us about typical sensory-related issues that children may experience when wearing their school uniform.
2	Do you know of anything that can be done to a garment to make it less irritating/more comfortable? (Home adaptations).
3	Do you think that the different types of fabrics used in garments influence the level of irritation?
4	Which type of closure would you consider most irritating to the sensory child and why?
5	Do you think how the pieces of fabric have been sewn together has an influence?
6	Are there specific types of collars or necklines that are more irritating than others?
7	Is there anything related to a sleeve that you have found to irritate?
8	On girl's skirts, pants, and shorts, as well as boys' pants and shorts, have you picked up that the sensory child experiences any irritation with the waistband of the garment?
9	Tell us about the labels on your child's school uniform. Are there any particular labels as well as specific placement locations that your child regards as irritating?
10	Are there any particular decorative elements or school branding techniques that might irritate you?

Recordings were downloaded and transcribed using the Otter.ai application. One of the researchers checked and corrected the transcriptions by reading through them while listening to the recordings. The data analysis thereafter continued using qualitative analysis software (Atlas.ti).

The research team developed an initial code book with *a priori* codes by using the insights gained from facilitating the first two focus group discussions and a thorough literature review. The first coding cycle used this initial code book. During this coding cycle, the coders identified new codes and made notes of possible adaptions to the initial code book, such as the merging of certain codes. A meeting was held in which the researchers discussed and debated the codes used, the exact definitions of the codes, as well as the identification of possible themes. The meaning of certain codes was debated until consensus was reached and all coders agreed on the codes and their meanings. The code book was revised and a second coding cycle took place using the amended code book to promote researcher reflexivity (Cofie et al., 2022). Through thematic data analysis, key themes and subthemes emerged and were interpreted to make sense of the data.

Each participant in the focus group discussion was labeled with a number between 1 and 16. In using this form of labeling, none of the participants' identities were disclosed, instead they are referred to as P1, P2, up to P16. With the use of Atlas.ti, specific line numbers were assigned to the different lines in the transcribed dialog. For example, when referring to line 15 in the transcribed discussions with Participant P2, it is referred to as P2:15. Specific swatch elements under discussion are included in brackets within the quotes.

Since this study was designed based on a constructivist paradigm, which assumes a relativist ontology and a subjectivist epistemology, trustworthiness was important throughout the process. The research team constantly used the criteria of Lincoln and Guba (1985) as a guide. Together with purposive sampling, the continuous meeting and debriefing of the research team contributed to credibility (Niewenhuis, 2019). Thick descriptors, in terms of a full description of the research design and description of participants, enhanced transferability (Niewenhuis, 2019). In addition, a transparent description of the methodology and aspects such as the use of quotes verbatim with the corresponding Atlas.ti line numbers increased the audit trail and contributed to confirmability (Denzin & Lincoln, 2018).

To evaluate and report on intercoder reliability, which is related to dependability, Cofie et al.'s (2022) checklist was used consisting of eight main aspects that are needed for intercoder reliability. This study followed the guidelines outlined in this checklist as shown in Table 3, which supports the reliability of the findings.

Findings

Through thematic analysis, three main themes were identified: Textiles, Design, and Construction. The findings are presented per the identified theme. Each theme is discussed in terms of the difficulties identified (Objective 1), together with the possible adaptations related to them (Objective 2).

Textiles

Participants discussed that different aspects of a textile may contribute to sensory irritation. One of the most dominant aspects was the influence of fiber content, as children had a definite preference for natural fabrics—specifically garments with a high cotton fiber content as opposed to synthetic fiber content. One participant indicated "…they prefer cotton over any other fabric" (P7:20), while another participant added that she "… just noticed with my own children that anything more natural and less synthetic is much better. But something more sort of cotton, like a cotton t-shirt, is more tolerable" (P8:28). A participant reported that it can be so extreme that merely looking at a certain garment can

Table 3. Intercoder Reliability Checklist.

Aspects of intercoder reliability	Present	Justification (if "no" selected)
There was a minimum of two coders.	Yes	
At least one coder was removed from data collection (to address bias).	Yes	
At least one coder had expertise and previous experience with coding qualitative data.	Yes	
If there were multiple participant groups, a minimum of two researchers (coders) coded transcripts from each participant group.	Yes	
The coders used the same framework for analysis (e.g., inductive, deductive, abductive).	Yes	
Coders focused on the shared meaning of codes[a] through dialog and consensus.	Yes	
Another coder with expertise in qualitative methods was consulted to resolve outstanding conflicts.	No	No unresolved conflicts with the code book or coding occurred.
Coder consensus resulted in a codebook that was applied when coding the remaining transcripts.	Yes	

[a]The code names do not have to be identical, but the meaning of the codes must be the same.
Note. The checklist was developed by Cofie et al. (2022).

trigger an emotional reaction, stating "If you think about that synthetic kind of school jersey[1], just the look of it can even set off an emotional reaction…" (P5:66).

Fabric hand is influenced by more than merely the fiber content, and other aspects, such as fabrication (how the fabric has been woven or knitted), also play a role. Although no participant explicitly explained it in this manner, the discussions naturally flowed from fiber content to a more broad discussion of fabric hand. The descriptors that were mostly used to describe fabric hand were "soft" versus "scratchy." Not surprisingly, it was noted that children prefer textiles with a softer hand. Participant contributions included: "[the best option is] something that is more soft and less scratchy for them" (P9:43); "My daughter does not like jerseys at all. I think it is more the scratchiness of the material. Blazers are softer on the inside than jerseys are…" (P11:145); "He does not like scratchy material. He wants soft material" (P13:163).

Many parents indicated that their children find secondhand school uniforms more tolerable, as these garments have a softer hand and are more comfortable due to prolonged wear and laundering. One participant indicated "I would rummage through those boxes at the second-hand shop to try and find the material that was the least noisy and the softest" (P2:31). Another parent commented "Luckily, my son also wears the [jacket], but it must be very soft and old. So he takes his brother's one" (P16:160).

Instead of purchasing secondhand garments, other parents would wash their children's school uniforms profusely to try and soften the fabric, however, with some textiles, the effect is marginal, with one participant mentioning "…even if you washed it, it just does not go soft. It is very synthetic" (P2:31).

Another interesting aspect related to textiles was the effect that pilling had on the comfort that the child experiences. One parent mentioned:

> [My child gets] an immediate reaction to the pilling of fleece tops. You know, the response is so strong! I think it is obviously because it touches into the light touch receptors. So, you kind of go [in]to an immediate stress response, which we cannot work through. (P4:53)

It was also reported that the sound a piece of fabric makes can influence the child's calm and alert state. A participant stated that "The tracksuit made a noise you know … and she just could not stand the sound that the pants made" (P2:31).

School jerseys were discussed repeatedly. This item may be very problematic due to the fabric hand. Comments included: "Anything like a school jersey with a sort of a hard texture is not, it is not really something that she likes" (P12:187). The jerseys create problems for parents because the child needs to wear something warm when it is cold. One mother explained: "So, if your child is refusing to wear the jersey, you know, then you're kind of really are stuck because there is only so much you can do to keep them warm" (P2:97).

Design

Apart from textiles, participants identified numerous other sensory triggers, such as collars, sleeves, cuffs, waistbands, and wearing ease, which were grouped and labeled as "design aspects." Although there are a great variety of properties related to the design of a school uniform, only the aspects that were prominent and related to sensory sensitivity are discussed.

Neckline and Collar. Participants continuously indicated the sensitivity of the neck and that a neckline or collar that is restrictive and/or stiff can be unbearable. One parent mentioned: "He wears a golf shirt which he absolutely hates because the golf shirt has a collar in, he hates collars" (P10:122). Another parent explained:

> Number 55 [collar with a stand] would immediately elicit that meltdown in my daughter, so the minute it starts being around her neck she would go: 'Oh, I hate this! I hate this!' and then it would just trigger this meltdown and it is really quite extreme. (P2:180)

It was pointed out that certain collars feel like they consist of cardboard, "The stiff collar [is problematic] as well. It actually feels like there's a carton in the actual collar. So, it is very uncomfortable" (P3:37).

Furthermore, it was revealed that when the top button of the shirt (in many cases situated on the collar stand) is fastened, or when the child is expected to wear a tie, it becomes a sensory nightmare. Parents mentioned: "But the first two buttons are loose because she cannot handle it [fastened]. [She says] it feels like she is being strangled" (P14:478); "And a tie, that was a disaster!" (P15:127). Another participant mentioned:

> …they [are] expected to wear the white shirt with a stiff collar and tie. So as soon as one has to tie that top button, it becomes unbearable, and so we always ended up not tying the top button and trying to get the [tie] just kind of covering it. (P2:25)

Many different closures were discussed during the focus group interviews, including buttons, zippers, and Velcro®. The only fastener that proved to be problematic from a sensory perspective was the button, and specifically the button at the neckline.

Sleeves and Sleeve Finishes. The findings related to sleeves and sleeve finishes indicated that these properties can cause severe irritation. The dislike towards long-sleeved garments was prominent. Comments included: "…in winter it's worse with, with being cold and not wanting long sleeves" (P12:325); "…he doesn't like his long sleeve shirt" (P10:122). It was mentioned that children experienced great discomfort from the buttoned-up cuffs often found on long-sleeved shirts: "The long sleeve shirt for winter has got a cuff on the end, which he absolutely hates" (P10:110).

Waistlines. Discussions surrounding the waistline finishes of school uniforms pertained mainly to the type and position of the waistband. Specifically, waistbands that include elastic appeared troublesome: "Our greatest challenge is actually with the skirt because for some reason that elastic around her waist just triggers her" (P11:109). It was indicated that the irritation originated from the elasticized waistband's ruffled effect and bulky texture. Some parents revealed that they purchase bigger-sized, soft underwear that creates a barrier between the waistband and the child's skin, which ultimately prevents the elasticized waistband from touching the child's body. A participant explained: "We get softer and bigger underwear for him to wear, so the elastic won't lie against his back and touch his skin, because he hates the ruffle effect" (P6:65).

It was also determined that for some children, the discomfort is not so much related to the type of waist finish, but rather the position of the garment on the body. Again, it was mentioned that parents would often buy larger-sized garments, this time to change the position of the waistband for it to fit on the child's hips. This adaptation is often implemented to prevent the waistband from being positioned on the naval, which is regarded as a highly sensitive area. Two participants explained:

> Something that I have done personally is to size up for my daughter's [uniform, because] they do not like it [the waistband] in their stomach or in the waist or such. So, they wear it [the waistband] on the hips. Because that is more comfortable for them. (P8:161)

> So if anything about the school uniform is bothering her it is too tight around the waist or it is scratchy, that is just going to add on to her anxiety and obviously, it is going to affect how she performs in school. (P11:391)

Ease. An additional point of discussion was the wearing ease of school uniforms. Mixed findings about wearing ease were received. Some participants mentioned that their children prefer tight and form-fitting clothing: "He likes tight clothing on his body" (P13:163).

> He could not handle the gray pants that they have to wear [because] it had to be wide. He hated the fact that the pants was wide so what he did was he would put the skinny jeans under his pants because he hated that feeling. (P13:157)

> And then they have got for winter, what they call a sleeve shirt that they wear underneath the sports clothes. And for some reason, she loves the shirts. And it is because it is also a constricting shirt. It is a soft nylon material that is soft against the skin, and it is also tight-fitting, so it must be comforting to her. (P11:229)

Other participants mentioned that children prefer loose garments that allow movement. Participants stated: "So my daughter really, really doesn't like tight clothes … anything that fits tightly is very difficult" (P12:187); "I always have to buy bigger sizes" (P12:193).

Furthermore, it was indicated that many children avoid wearing various layers of clothing over one another, and even avoid tucking in their school shirts, as they dislike the fabric layers tucked into the waistband of their school bottoms. It could be assumed that layering contributes to the actual tightness and restrictiveness of garment fit. "The winter uniform is for me is more challenging because my kids do not like layers, they refuse to wear the layers" (P2:97); "But, but we buy a size bigger [shirt]. And we [don't tuck] it into his pants so his shirt hangs over and then he is fine with it" (P16:148); "She gets irritated with the feeling of the two different garments over each other" (P8:64).

Embroidery. Participants revealed that embroidery on school uniforms also causes sensory irritation. They indicated that many children experience discomfort from the stabilizer (backing of embroidery)

and bobbin thread of the embroidered school name or school crest, which is generally positioned on the chest. Various adaptions were explained that included the application of an iron-on school badge instead of the embroidered badge (where possible) and attaching a soft piece of fabric on the inside of the garment to prevent the stabilizer and thread from scratching the child's body. Participants noted:

> I found with my son he had an embroidery on his shirt, and the inside they had that backing and it is itchy. That was a huge irritation, I had to put on a softer backing. Just so he could wear that. (P6:214)

Another adaptation that came out of the discussions was to embroider a separate piece of fabric, such as a patch pocket, and attach it to the garment to prevent the stabilizer and bobbin thread from touching the skin. Participants mentioned: "So, at my kids' school, fortunately, that they have put that crest on a pocket and then sewed the pocket to the golf shirt. So that has definitely helped … that embroidery does not touch the skin" (P2:220); "I would suggest to embroider the school badge onto a pocket. And sew the pocket onto the shirt. In that way, the embroidery would not irritate the child's skin or [be] rubbing, constantly rubbing on them" (P7:224).

Construction

Two main construction properties came to the fore during the focus groups: seams and labeling.

Seams. It has been well established that seams are a big culprit contributing to sensory overreactivity (Kyriacou et al., 2023; Roy et al., 2018; Shin & Gaines, 2018). This finding was supported in the present study. A parent mentioned: "My son is very sensitive to clothing and clothing that scratches; he doesn't like seams at all!" (P10:82). Based on the swatches, it was identified that a superimposed seam with an overlocked edge finish was deemed as the least favorable and that this seam type (which is one of the most widely used seam types in school uniform clothing) caused the most irritation to children. A participant stated:

> Like number 60 (superimposed seam with an overlocked edge) that you sent us has a little flap, that flap does not always fall correctly. And that flap can twist and turn inside of your shirt or jersey because it is not fastened to the whole piece of material. And that scratches them a lot! (P7:79)

Since the seam allowance of a normal superimposed seam is not flat but creates a "flap," it increases tactile stimulation. Participants indicated that a flat felled seam is a more tolerable seam type. Participants noted that: "I think number 59 [flat felled seam] is a good seam. I do not think that will bother him because it is not open or scratchy feeling" (P10:82).

Furthermore, it was indicated that a solution was to wear undergarments inside-out underneath the school uniform to avoid any seams from touching the body. An OT noted: "One of my therapy kids, she wears a vest underneath her school shirt, and that makes [it more tolerable] for her. It is also inside out. But then that makes wearing her school shirt and uniform more bearable" (P5:80).

It was mentioned that by ironing, the effect of a seam can be managed to a certain extent. "So, if I am … if you look at number 60 (superimposed seam) I would have to make sure that the overlocking is to one side, by ironing it and make sure it stays like that" (P10:82). Similarly, as noted with some of the previous properties explained, certain areas of the body appear more sensitive than others. Therefore certain seams in certain positions are more bothersome than others. One participant stated: "kids struggle with the seams on the sides of the body and the abdomen and then also the arms, especially the forearm" (P9:97).

Another participant mentioned:

> Normally your stitching would be on the inside of your arm, on your radius bone side. So, they will pull it up until (it's) above the elbows, and then they will be fine. It would not irritate them. It is as if the skin on the inside of your arm is more sensitive than the skin on top of your arm … they get so irritated with the seams on the inside of their arms. (P7:112)

Labels. Labeling in school uniforms was discussed as problematic, as the fabrication of the label as well as its placement highly influenced sensory overreactivity. Some participants referred to them as "labels" and others as "tags." Participants indicated that they have to cut out labels from garments to alleviate the irritation: "…because you know those (labels) can be cut out" (P4:53); "… we cut off labels for his shirts" (P6:65).

However, it was also explained that merely cutting out the label is not as effective as fully removing it by unpicking it from the garment. Participants explained: "But if you cut them [labels] off, then there is actually a little bit left because you cannot cut it right off in the seam" (P8:182); "I buy clothing without tags. I have had many years of experience with tags with my son. So if clothing does have a tag I unpick the tag or else I buy clothing that is tagless" (P10:185).

It was clear that the label placement at the back of the neck causes the most irritation. A participant noted:

> …but any labels by his neck, that is the worst for him. He does not want that feeling by his neck, because he immediately, he scrunches up and he pulls his head back. And he just he freaks out. He does not like it at all. (P1:199)

Summary of Adaptations

Although the findings of Objectives 1 and 2 were presented per identified theme, a summary of the findings of Objective 2 was made in table format to capture the key adaptations. The information presented in Table 4 aims to assist parents with valuable adaptation strategies which they can easily implement. Furthermore, the suggestions may assist parents to make the correct clothing choices for their children to alleviate irritation and decrease the effects of sensory overreactivity. This resource may also assist OTs in their daily practice by providing evidence-based advice to their clients.

Discussion and Conclusions

The purpose of this study was to explore and describe the properties of a school uniform that manifest in sensory overreactivity. The diverse views and contributions of the participants provided an in-depth understanding of the research problem and therefore support the constructivist paradigm that was applied. As indicated previously (Kyriacou et al., 2023), the fabrication of clothing plays an important role. Cotton, a natural fiber, was identified as being more tolerable than synthetic fibers. Overall, fabrics that are perceived as scratchy cause extreme discomfort, and those that are perceived as soft are more favorable. Preloved, older clothing is softer and more comfortable than new clothing. When pilling starts to form on the fabric's surface, it can be very irritating.

When designing a school uniform, certain choices can enhance the inclusivity of the design. An inclusive design enables everyone to participate equally in everyday activities without barriers that create separation (McBee-Black & Ha-Brookshire, 2020). The neckline of a garment is pivotal. It might be a better decision to eliminate the collar of a shirt, but if it is unavoidable, it would be better to choose a shirt collar instead of a collar with a stand that is worn with a tie. Overall, a tie was considered a problematic item. The less restrictive the garment is around the neckline, the

Table 4. Possible Adaptations to Decrease the Effects of Sensory Overreactivity.

Theme	Problem	Possible adaptation
Textiles	Fibre content	Choose the option with the highest cotton content.
	Fabric hand	Choose the option with the softest fabric.
		Purchase secondhand school uniforms.
		Wash garments several times before wear.
	Pilling	Remove pilling with a bobble-off device.
	Auditory	Avoid noisy fabrics.
Design	Neckline and collar	Avoid a collar or opt for an open collar instead of a collar with a stand.
		Do not button the shirt to the top.
		Avoid wearing a tie.
	Sleeves and sleeve finishes	Avoid long-sleeve shirts with buttoned-up cuffs.
		Winter: if too cold, wear a cotton long-sleeve shirt underneath a short sleeve school shirt.
	Waistlines	Avoid waistlines that end around the navel.
		Turn the waistband over if the inside is scratchy.
	Ease	Too tight: purchase bigger sizes.
		Too loose: wear tight-fitting garments underneath the uniform.
	Embroidery	Opt for a fused-on instead of a stitched-on school crest.
		Cover the thread on the inside of the garment with fusible interfacing.
Construction	Seams	Choose the option with the flattest seams on the inside of the garment (e.g., flat felled seams).
		Avoid scratchy seams from touching the skin by wearing a sensory-friendly garment underneath the uniform.
		Sew the "flap" of the seam to the garment.
	Labels	Instead of cutting out, unpick all labels.

better (Kyriacou et al., 2023). Buttons that button up to the neck can also be unfavorable. Elasticized waistlines can be uncomfortable, especially when the garment fits around the natural waist. If the garment fits on the hips, the irritation tends to be less. Concerning design ease and wearing ease, the findings were inconclusive. Some children prefer loose clothing and others prefer tight-fitting clothing. Embroidery can potentially irritate the wearer depending on placement and whether the stabilizer and bobbin thread touches the skin.

Although many studies have indicated that seams are extremely problematic in terms of sensory overreactivity (Roy et al., 2018; Shin & Gaines, 2018), this study expands on existing literature by describing the effect of different seam types. A superimposed seam with an overlocked edge finish was deemed as the most irritating seam type, which is unfortunate since it is the most basic seam type used in clothing construction (Shaeffer, 2013). The seam type that was selected as a more sensory-friendly option was a flat-felled seam, which is understandable since it has no protruding ends.

When constructing a garment, labels are stitched into the garment. Some label information is legally required and therefore may not be omitted (Shaeffer, 2013). However, there is legally no specification regarding the placement or type of label (printed, end-fold, satin label). Back neck labels were identified as the most problematic and printed labels as the least problematic. As found previously, after purchasing, the complete removal of a woven label (unpicking) is an effective at-home adaptation and is regarded as more effective than cutting out the label (Kyriacou et al., 2023).

This study makes a valuable academic contribution that can serve as the starting point to fully understand the sensory aspects of clothing. Similar to other studies (Ilić-Savić et al., 2021; Kyriacou et al., 2023), the findings confirm that a school uniform can indeed play an important role in enabling inclusive and equitable quality education. Although this study was conducted in South Africa, an emerging market, the findings and adaptation possibilities can be applied to other

contexts. Even in areas where school uniforms are not worn, the findings may be applied to everyday clothing to reduce the negative impact that it can have on a child's education and other areas of daily functioning. Any school can benefit if the adaptations are taken into consideration when designing a school uniform to encourage inclusive design. Adaptations link specifically to Sustainable Development Goal number four of the United Nations, which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (Kusimo & Chidozie, 2019).

Lastly, the information provided by this study may encourage schools to reconsider certain aspects of their uniforms to make them more inclusive for all children. In doing so, schools may enhance learning and student well-being. This study did not focus on whether a school uniform should be worn or not, rather, it attempted to assist in pointing out the problematic properties of the garments so that they can be managed. Ultimately this study can be of assistance in ensuring appropriate recommendations for making school uniforms that are more inclusive and that ultimately enhance the learning and well-being of children.

Limitations and Suggestions for Future Research

Due to the qualitative research approach, the findings of this study cannot be broadly generalized. Specific limitations of the focus group interview method are that bias can occur if more outspoken individuals dominate the discussion and the viewpoints of less assertive individuals may not be fully assessed (Niewenhuis, 2019). Although it was impossible to have face-to-face focus group interviews due to the COVID-19 lockdown restrictions, doing so might have been more conducive to open communication, since the interviewer could have reacted to body language and facial expressions. This study also did not explore cultural, income, or age differences, which may limit the applicability of the findings. Investigating the impact of factors pertaining to culture, income, and age may provide a deeper understanding of the research problem and is therefore recommended in future research.

Throughout the study, valuable insights came to the fore unrelated to school uniforms. It was clear that socks, shoes, and underwear are a sensory nightmare, and, due to the magnitude of difficulties they create, may warrant a separate study. As children are the consumers of their clothing, their perceptions on this topic should also be investigated. It is hoped that through clothing, the well-being of children with sensory overreactivity can be enhanced.

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