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Terminated Sessions of Functional Communication Training: Effects on Sensory Hypersensitivity and Challenging Behaviors in Children with Autism Spectrum Disorder across Educational Contexts

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Abstract

This study examined the effects of terminated Functional Communication Training (FCT) on self-injurious and self-stimulatory behaviors linked to seven sensory hypersensitivity domains (visual, auditory, tactile, olfactory, gustatory, vestibular, and proprioceptive) in children with autism spectrum disorder (ASD). A true experimental pre-test/post-test control group design was employed with 30 children aged 7–12 randomly assigned to an FCT group or control group. The 12-week intervention was followed by termination to test the persistence of behavioral gains. Intervention sessions were implemented not only in structured centers but also in children's homes and classrooms, with caregivers actively engaged to support generalization in daily routines, ensuring delivery in naturalistic, inclusive settings. Outcomes were measured using validated sensory profiles and direct observation checklists at baseline, post-intervention, and one-month follow-up. Results showed a 46.54% reduction in hypersensitivity-related behaviors, with greatest improvements in visual (13.51%) and tactile (9.07%) domains. Findings indicate that while FCT yields short-term behavioral benefits, sustained intervention or gradual fading is needed for long-term maintenance. Implications extend to global educational contexts, highlighting culturally responsive and resource-sensitive strategies for children with ASD and sensory hypersensitivities.

Keywords: functional communication training, autism spectrum disorder, sensory hypersensitivity, self-injurious behaviors, intervention maintenance

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by persistent challenges in social communication and interaction, alongside restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013). A significant proportion of individuals with ASD also experience atypical sensory processing, including hypersensitivity across visual, auditory, tactile, olfactory, gustatory, vestibular, and proprioceptive domains (Ben-Sasson et al., 2009; Baranek et al., 2014). Sensory hypersensitivity can trigger maladaptive behaviors, most notably self-injurious behaviors such as self-biting or self-hitting, and self-stimulatory behaviors such as repetitive hand movements or object manipulation, which may severely affect learning, daily functioning, and quality of life, posing substantial challenges for caregivers and educators (Matson & Rivet, 2008).

Self-injurious and self-stimulated behaviours often serve multiple functions, including sensory regulation and communication of needs. When adaptive communication skills are lacking, individuals may rely on maladaptive behaviours to gain attention, escape demands, or seek sensory input (Carr & Durand, 1985; Durand & Carr, 1991). Functional Communication Training (FCT) is an evidence-based intervention that addresses these issues by teaching individuals to replace maladaptive behaviours with appropriate, socially acceptable communicative responses that achieve the same functional outcome. Originally developed by Carr and Durand (1985), FCT has consistently been shown to reduce problematic behaviours in individuals with ASD and intellectual disabilities (Lalli, Casey, & Kates, 1995; Wacker et al., 2013).

FCT is typically preceded by a Functional Behaviour Assessment (FBA) to identify the underlying function of the target behaviour, followed by differential reinforcement of an alternative communicative response (Marcus & Vollmer, 1996). The intervention may incorporate various strategies, such as extinction, redirection, and response blocking, to prevent reinforcement of maladaptive behaviours (Fisher et al., 1993; Steege et al., 1989). Moreover, parental and caregiver involvement are critical to the generalization and maintenance of skills across settings (Kaiser & Hancock, 2003; McConachie & Diggle, 2007).

While the short-term effectiveness of FCT is well documented, less is known about the durability of its effects after the intervention is terminated, particularly in relation to sensory hypersensitivity linked Self-injurious behaviors and self-stimulated behaviours. Given that sensory triggers vary widely in type and intensity, the effectiveness of FCT may differ across sensory domains, and behavioural gains may be vulnerable to relapse once active intervention ceases. There is a clear need to explore how the termination of FCT impacts the maintenance of behavioural improvements across multiple sensory modalities. Embedding FCT in home and classroom environments with caregiver involvement reflects a naturalistic orientation that enhances inclusion, aligning with contemporary international standards for supporting individuals with severe disabilities (Haider et al., 2024; Aftab et al., 2024).

The present study addresses this gap by examining the effects of terminated FCT sessions on the reduction of self-injurious and self-stimulated behaviours linked to seven sensory hypersensitivity domains in children with ASD. By comparing outcomes between an experimental group receiving FCT and a control group receiving standard care and by assessing changes at post-intervention and follow-up, this study provides insight into both the immediate and sustained effects of FCT. The findings have implications for intervention planning, particularly in developing strategies to maintain behavioural gains over time.

Literature Review

Functional Communication Training (FCT) is an evidence-based intervention that teaches individuals to use appropriate and socially acceptable communicative responses that allow them to access the reinforcer maintaining a problematic behaviour (Carr and Durand, 1985). Since its introduction, numerous studies have demonstrated that FCT can effectively and rapidly reduce challenging behaviours in individuals with developmental and intellectual disabilities, including ASD (Carr and Durand, 1985; Lalli et al., 1995). In their seminal work, Carr and Durand (1985) replaced children's disruptive behaviours with the verbal response "I don't know" during difficult academic tasks, achieving significant reductions in problem behaviours.

Wacker et al. (2013) emphasized that FCT outcomes can vary considerably depending on the functional analysis procedures used and the consequences applied for problem behaviours such as self-injury and stereotypy. Commonly integrated strategies include extinction to eliminate reinforcement for antisocial responses (Fisher et al., 1993; Lalli et al., 1995), extinction combined with response blocking or brief physical restraint alongside changes in environmental conditions (Carr & Durand, 1985; Durand & Carr, 1991; Shirley et al., 1997), extinction with redirection (Bird et al., 1989; Steege et al., 1989), and, in some cases, mild punishment procedures to reduce behaviour persistence (Iwata et al., 1982; Fisher et al., 1993).

FCT is typically preceded by a functional behaviour assessment to determine the function of the target behaviour, followed by teaching a replacement communicative response that serves the same purpose (McIntosh et al., 2008). Often, FCT is implemented using differential reinforcement (DR), in which the individual is reinforced for performing an alternative communicative response that produces the same class of reinforcement as the original problem behaviour (Kramer & Rilling, 1970; Marcus & Vollmer, 1996). The unique feature of FCT, as noted by Leitenberg, Rawson, and Mulick (1975), is that the alternative behaviour is a clear, functional form of communication, such as speech, sign language, the Picture Exchange Communication System (PECS), or speech-generating devices that is socially valid and contextually appropriate.

Parental involvement is a critical component of FCT success. Parents are not only implementers of intervention strategies but also essential contributors to data collection and skill generalization. Research highlights that parental engagement in intervention programs significantly improves behavioural and developmental outcomes in children with ASD (Crockett, Fleming, Doepke, & Stevens, 2007; Symon, 2005; Koegel, 2000). Actively involved parents can reinforce alternative communication responses across natural environments and routines, thereby promoting maintenance and generalization of skills (Kaiser & Hancock, 2003; Aman et al., 2009; Alexander & Robbins, 2011). Moreover, parents provide valuable contextual information for tailoring FCT programs (McConachie & Diggle, 2007) and can reliably track behavioural data at home and in community settings (Derby et al., 1997).

In the context of sensory hypersensitivity, FCT offers particular promise as it not only addresses the function of behaviours but can also reduce maladaptive responses to sensory triggers by replacing them with functional communication. This aligns with sensory processing research indicating that maladaptive self-injury and stereotypy often serve both communicative and sensory-regulatory purposes (Ben-Sasson et al., 2009; Baranek et al., 2014). Consequently, FCT in sensory-based interventions may require adaptation to ensure that both the sensory and communicative functions of behaviour are addressed simultaneously.

Research Objectives

1. To examine the effects of functional communication training (FCT) on reducing self-injurious and self-stimulated behaviours in individuals with sensory hypersensitivity across seven sensory domains.

2. To investigate how the termination of FCT sessions influences the relapse of behavioural improvements.

3. To explore the relationship between reductions in hypersensitivity dimensions and decreases in self-injurious and self-stimulated behaviours.

Research Questions

1. What is the effect of FCT on reducing self-injurious and self-stimulated behaviours related to different sensory hypersensitivity domains?

2. How does the termination of FCT sessions impact the level of reduction in these behaviours?

3. Is there a significant relationship between changes in hypersensitivity dimensions and changes in self-injurious and self-stimulated behaviours?

Research Methodology

Research Design

This study employed a true experimental research design with a pre-test and post-test Control Group Design to rigorously examine the causal effects of terminated FCT sessions on hypersensitive dimensions and related self-injurious and self-stimulated behaviours in children with ASD. The experimental group consisted of participants receiving the FCT intervention, while the control group included participants receiving no intervention or only standard care. Random assignment of participants to these groups employed to minimize the influence of extraneous variables and to enhance the internal validity of the study, ensuring that any observed differences in outcomes can be more confidently attributed to the intervention itself.

Participants

The study population was comprised children diagnosed with moderate to severe ASD who exhibited self-injurious and self-stimulatory behaviours associated with sensory hypersensitivity. A sample size of approximately 30–40 participants (15–20 in each group) was determined based on power analysis to detect medium effect sizes, with a significance level of $\alpha = .05$ and statistical power $(1-\beta) = .80$. A stratified random sampling technique was employed to ensure adequate representation across variables such as age, gender, and severity of hypersensitivity. Inclusion criteria required a formal ASD diagnosis by a qualified clinician, the presence of self-injurious or self-stimulatory behaviours linked to sensory hypersensitivity, and an age range of (e.g., 4–12 years). Participants excluded if they have severe cognitive impairments that prevent participation or other neurological disorders unrelated to ASD.

Instruments and Measures

FCT protocol was implemented using a standardized intervention manual that was tailored for each participant based on the results of their functional behavior assessment. The *Sensory Profile Questionnaire*, or an equivalent scale, was used to assess hypersensitivity levels both before and after the intervention across the seven sensory dimensions, utilizing a 5-point Likert scale. A Behavioral Observation Checklist, which had been developed and validated, was employed to record self-injurious and self-stimulated behaviors during intervention sessions and in daily activities. Data recording tools, including video recordings and direct observation logs, were utilized to validate the accuracy of behavior counts.

Procedure

The study was conducted in two community-based educational centers as well as participants' homes. To enhance ecological validity, generalization probes were systematically embedded in classrooms, with caregivers trained to reinforce strategies during daily routines

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(e.g., mealtimes, brushing, play). This design ensured that the intervention was delivered in naturalistic and inclusive environments, not limited to structured therapy rooms.

Pre-Intervention Phase (Baseline): In the pre-intervention phase (baseline), each child underwent a Functional Behavior Assessment (FBA) conducted by a trained behavior analyst with BCBA-equivalent credentials. Direct observations of 20 minutes each, across three sessions in school, home, and clinic contexts, were carried out to identify antecedents and consequences maintaining the problem behaviors. To ensure measurement accuracy, inter-observer agreement (IOA) was calculated for 25% of baseline sessions, with agreement levels consistently above 85%.

Intervention Phase: During the intervention phase, children in the experimental group received Functional Communication Training (FCT) sessions three times per week for 12 weeks. Each session lasted approximately 45 minutes and was conducted in a quiet room at school for two sessions per week and at home for one session per week. Sessions followed a consistent structure. The first five minutes were devoted to a warm-up period, during which previously taught skills were briefly reviewed and visual cues were provided to prime the child for participation. The core of the session consisted of a 30-minute block of structured teaching trials, during which children were explicitly taught alternative communication responses (e.g., spoken words, gestures, or Picture Exchange Communication System [PECS]) to replace identified SIB and SSB. A least-to-most prompting hierarchy (verbal, gestural, physical) was employed, and reinforcement was matched to the function of the problem behavior (for example, providing a break card for escape-maintained behaviors or a preferred sensory item for behaviors maintained by automatic reinforcement). Extinction procedures were implemented by withholding reinforcement when SIB or SSB occurred. Each session typically included 15–20 trials, with the introduction of new stimuli contingent upon the child demonstrating 80% accuracy in producing alternative responses. The final 10 minutes of each session were used for closure activities, which included reinforcement fading, debriefing with the caregiver, and documentation of session performance. Generalization probes were conducted weekly in natural contexts, such as classrooms or homes, led by teachers or caregivers and monitored with fidelity checklists.

Experimental Group (FCT Intervention): Children assigned to the experimental group received Functional Communication Training (FCT) as the active intervention. Sessions were delivered three times per week for twelve weeks, with each session lasting approximately 45 minutes. Two sessions were conducted at school and one at home to promote generalization. Each session included a structured warm-up, teaching trials, and closure. During teaching trials, children were explicitly taught to replace self-injurious and self-stimulatory behaviors with alternative communicative responses, using a least-to-most prompting hierarchy. Reinforcement was matched to the function of the behavior, while extinction was applied to problem behaviors. Generalization probes were built into weekly school and home routines. Caregivers in this group also received weekly 60-minute training sessions with modeling, guided practice, and structured home assignments. Their fidelity of implementation was monitored, averaging above 85% by the fourth week. Treatment fidelity across the intervention was maintained through video-recorded sessions, with independent observers scoring 20% of sessions and reporting mean integrity of

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88%. Inter-observer agreement for behavioral observations was consistently high (M = 90%). After the twelve-week intervention, FCT was terminated abruptly to examine relapse effects, and no fading or booster sessions were provided.

Control Group (Standard Care): Children assigned to the control group continued receiving their standard educational and therapeutic services, including speech therapy, occupational therapy, and classroom support. Importantly, these services did not incorporate structured communication training or extinction-based procedures. This ensured that any differences in outcomes between groups could be attributed to the FCT intervention rather than overlapping components. Data for the control group were collected in the same manner as the experimental group, including caregiver logs and direct observations, to allow for consistency and comparability of outcomes.

Caregiver Involvement: Caregiver involvement was a critical element of the intervention. Caregivers attended a weekly 60-minute training session, delivered either in small groups or individually. Training sessions involved modeling of FCT procedures using video and live demonstrations, followed by guided practice with immediate feedback. Caregivers were given structured home practice assignments (10–15 minutes daily) to reinforce communication responses. Fidelity was measured using a 12-item checklist that assessed procedural adherence, including correct prompting, reinforcement timing, and extinction procedures. By the fourth week of intervention, caregivers consistently achieved fidelity ratings of 85% or higher, indicating reliable implementation of FCT strategies in natural contexts.

Treatment Fidelity and Reliability: To maintain treatment fidelity and reliability, 20% of all FCT sessions were video-recorded and scored independently by trained observers. The mean treatment integrity score across these sessions was 88%. Inter-observer agreement for behavioral data was calculated on 30% of sessions, with mean agreement of 90% (range: 85–95%).

Termination Phase: Sessions were deliberately distributed across school and home contexts to maximize generalization. Generalization probes in classrooms and daily routines, alongside caregiver-led practice, ensured the intervention was embedded in natural, inclusive settings. In the termination phase, FCT sessions were discontinued abruptly after the 12-week intervention to evaluate the effects of termination on behavior maintenance. No booster sessions or fading procedures were introduced during this phase. Caregivers were instructed to revert to routine care and not to prompt the use of FCT responses. Outcome measures were collected immediately following termination and again after a one-month follow-up period to assess persistence or relapse of treatment effects.

Control Group: Children in the control group continued to receive their standard educational and therapeutic services, such as speech therapy, occupational therapy, and classroom support. These services did not include structured communication training or extinction procedures. Behavioral data for the control group were collected using the same observation system and caregiver logs to ensure consistency with the experimental group.

Data Collection

Data were collected at three time points: pre-test, conducted before the intervention; post-test, conducted immediately after 12 weeks of FCT; and follow-up, conducted one month after the termination of FCT. Behavioral observations were recorded during intervention sessions as well as in daily living environments. Additionally, parents-maintained logs documenting behaviors and indicators of hypersensitivity throughout the study period.

Data Analysis

The Statistical Package for Social Sciences was used for data analysis. Data were analyzed using descriptive statistics, Pearson correlation coefficients, and false discovery rate adjustments to examine associations between reductions in hypersensitivity and decreases in behaviors. Additionally, linear mixed models were employed to account for repeated measures and to assess the time-varying relationship between hypersensitivity and behavioral outcomes.

Ethical Considerations

Written informed consent was obtained from parents or guardians of all participants. Confidentiality and anonymity of the participants were assured throughout the study. The right to withdraw at any stage without any penalty was granted to all participants. The intervention was halted immediately if any adverse effects were observed. Ethical approval for the study was obtained from the institutional ethics review board.

Validity and Reliability

Standardized and validated assessment tools were used in the study. Inter-observer agreement was established with a consistency level of 85% or higher in behavior recordings. Pilot testing of the FCT protocol was conducted to ensure intervention fidelity. Participants were randomly assigned to groups to minimize selection bias.

Results

Table 1

Visual Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-biting	Self-hitting, Self-scratching, Self-bouncing, Self-kicking
Self-Stimulated Behaviours	Moving fingers in front of eyes	Eye blinking

Note. The table shows that each behaviour type has a main (primary) behaviour and related (secondary) behaviours. For self-injurious behaviours, self-biting is the main one, with others like hitting, scratching, bouncing, and kicking occurring less often. For self-stimulated behaviours, moving fingers in front of eyes is the main one, with eye blinking as a related action.

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Table 2

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Bright lights	0.6718
Moving lights	1.4585
Changes in lights	0.5746
Going to bed for sleep	1.3433
Sunlight	2.1357
Eye-hand coordination	1.2157
Eye contact with peer/stranger	1.4703
Face washing	1.8752
Looking/thinking intently	1.1251
Darkness/loneliness	1.6404
Overall Reduction	13.5106

Note. FCT led to a 13.51% reduction in visual hypersensitivity-related problem behaviours, with the largest decreases linked to sunlight and moving lights.

Table 3

Auditory Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-hitting	Self-biting, Self-scratching, Self-bouncing, Self-kicking
Self-Stimulated Behaviours	Tapping ears	Making vocal sounds

Note. Table 3 indicates that for children with auditory hypersensitivity, the main self-injurious behaviour was self-hitting, often accompanied by other behaviours such as biting, scratching, bouncing, and kicking. The primary self-stimulated behaviour was tapping the ears, with making vocal sounds occurring as a secondary behaviour.

Table 4

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Atmospheric noises	1.3464
Man-made noises	0.8672
Appliance noises	0.7436
Transition from quiet to loud	1.2190
Ringing doorbells	2.2649
Mobile bells	0.9826
Overall Reduction	7.4237

Note. Table 4 shows 7.42% reduction in auditory hypersensitivity-related problem behaviours, most notably from ringing doorbells and atmospheric noises.

Table 5

Tactile Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-scratching	Self-biting, Self-hitting, Self-bouncing, Self-kicking
Self-Stimulated Behaviours	Rubbing skin with any object near her	Rubbing skin with her hand

Note. Table 5 shows that for tactile hypersensitivity, the main self-injurious behavior was self-scratching, often accompanied by biting, hitting, bouncing, and kicking. The primary self-stimulated behavior was rubbing the skin with an object, with rubbing the skin with the hand as a secondary behavior.

Table 6

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Hard touch by others	0.3000
Hard touch to objects	0.9889
Touching water bottle to open	0.6797
Holding pencil/writing	0.8540
Picking up eatables	1.0098
Playing with toys	1.5859
Washing hands/taking bath	0.7032
Outside temperature	0.8881
Nail cuts	1.2080
Holding books/school bag	0.8506
Overall Reduction	9.0682

Note. Tactile hypersensitivity behaviours decreased by 9.07%, with the largest impact from playing with toys and nail cuts.

Table 7

Olfactory Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-hitting	Self-biting, Self-scratching, Self-bouncing, Self-kicking
Self-Stimulated Behaviours	Smelling objects near her	Sniffing people near her

Note. Table 7 shows that for olfactory hypersensitivity, the main self-injurious behavior was self-hitting, accompanied by biting, scratching, bouncing, and kicking. The primary self-stimulated behavior was smelling nearby objects, with sniffing people as a secondary behavior.

Table 8

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Food smells	0.6941
Scents/perfumes/powders	0.7921
Flower fragrances	0.7234
Toothpaste smells	0.6215
Overall Reduction	2.8311

Note. Olfactory hypersensitivity behaviours reduced by 2.83%, mainly from scents/perfumes and flower fragrances.

Table 9

Gustatory Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-bouncing	Self-biting, Self-hitting, Self-scratching, Self-kicking
Self-Stimulated Behaviours	Licking objects near her	Placing objects in mouth

Note. Table 9 indicates that for gustatory hypersensitivity, the primary self-injurious behaviour was self-bouncing, with biting, hitting, scratching, and kicking as secondary behaviours. The main self-stimulated behaviour was licking nearby objects, accompanied by placing objects in the mouth.

Table 10

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Sharp tastes (lemon)	0.6926
Spices	0.6305
Salty foods	0.5246
Sweets	0.6267
Brushing	0.8122
Candies/chocolates	0.9264
Overall Reduction	4.2130

Note. Gustatory hypersensitivity problem behaviors were reduced by 4.21%, with improvements mainly linked to candies/chocolates and brushing.

Table 11

Vestibular Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-kicking	Self-biting, Self-hitting, Self-scratching, Self-bouncing
Self-Stimulated Behaviours	Rocking front-to-back	Rocking side-to-side

Note. Table 11 shows that for vestibular hypersensitivity, the primary self-injurious behavior was self-kicking, with biting, hitting, scratching, and bouncing as secondary behaviors. The main self-stimulated behavior was rocking front-to-back, accompanied by rocking side-to-side.

Table 12

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Rolling on bed	0.7885
Changes in walking surfaces/footwear	0.8374
Crowds or large open spaces	0.6592
Straight posture	0.8608
Looking downward to locate ground	0.5494
Using stairs	1.1473
Straight walking	1.5001
Overall Reduction	6.3427

Note. Vestibular hypersensitivity behaviours dropped by 6.34%, most reduced by straight walking and using stairs.

Table 13

Proprioceptive Hypersensitivity Related Behaviours

Behaviour Type	Primary Behaviour	Secondary Behaviours
Self-Injurious Behaviours	Self-kicking	Self-biting, Self-hitting, Self-scratching, Self-bouncing
Self-Stimulated Behaviours	Finger flicking	Hand jerking

Note. Table 13 shows that for proprioceptive hypersensitivity, the primary self-injurious behaviour was self-kicking, with biting, hitting, scratching, and bouncing as secondary behaviours. The main self-stimulated behaviour was finger flicking, accompanied by hand jerking.

Table 14

Sense-Related Antecedent Stimuli and Reduction %

Antecedent Stimulus	Reduction (%)
Lifting and carrying weight	0.6215
Stretching limbs	0.9269
Sitting on chair/carpet	0.7155
Pushing or pulling objects	0.8865
Overall Reduction	3.1504

Note. Proprioceptive hypersensitivity problem behaviours were reduced by 3.15%, with main gains from stretching limbs and pushing/pulling objects.

Table 15

Overall Reduction across All Sensory Dimensions

Sensory Dimension	Overall Reduction in Problem Behaviours (%)
Visual	13.5106
Auditory	7.4237
Tactile	9.0682
Olfactory	2.8311
Gustatory	4.2130
Vestibular	6.3427
Proprioceptive	3.1504
Total Combined Reduction	46.5397

Note. Across all seven sensory dimensions, the total combined reduction in targeted self-injurious and self-stimulated behaviours was 46.54%, indicating a strong positive impact of FCT on reducing hypersensitivity-related problem behaviours.

Table 16

Pearson Correlations between Reductions in Hypersensitivity and Decreases in Self-Injurious and Self-Stimulated Behaviours (Pre–Post Change Scores) in the Experimental Group

Hypersensitivity Domain	Self-Injurious Behaviours		Self-Stimulated Behaviours	
	r	*p* (FDR)	*r*	*p* (FDR)
Visual	−.48	.012 (.028)	−.41	.031 (.049)
Auditory	−.39	.042 (.063)	−.35	.058 (.072)
Tactile	−.52	.006 (.021)	−.46	.015 (.033)
Olfactory	−.28	.136 (.152)	−.22	.228 (.241)
Gustatory	−.25	.182 (.198)	−.19	.302 (.311)
Vestibular	−.44	.019 (.037)	−.40	.033 (.049)
Proprioceptive	−.37	.054 (.070)	−.30	.110 (.124)

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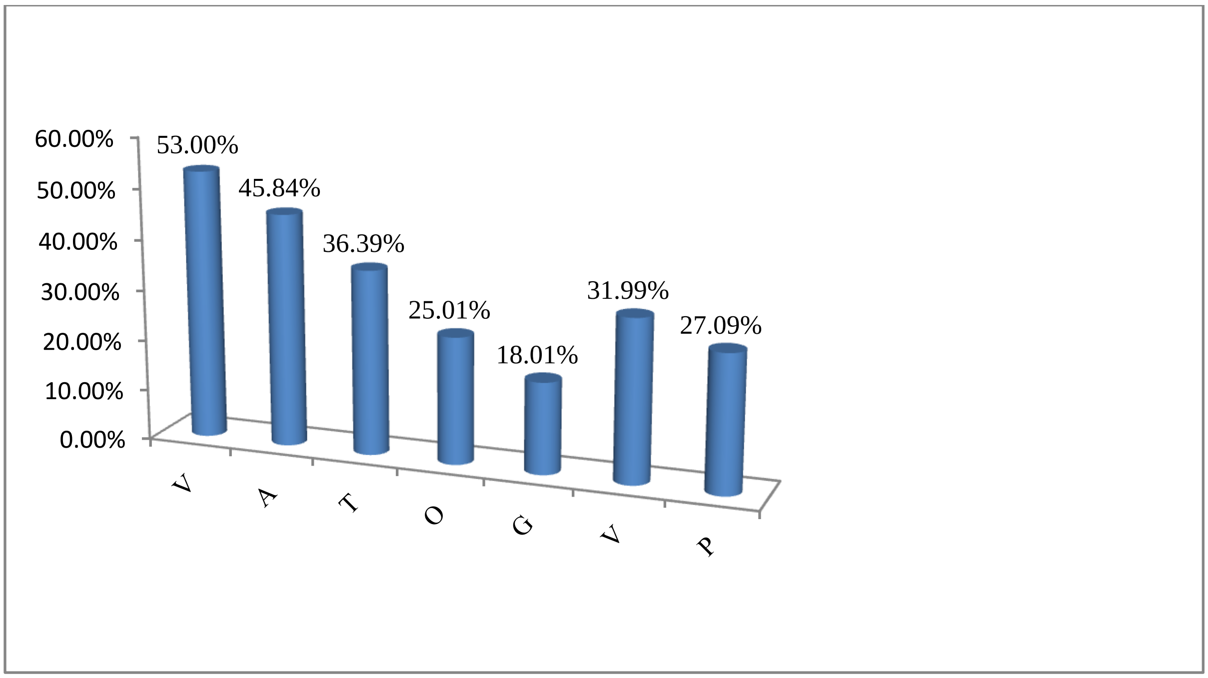
Note. Negative correlations indicate that greater reductions in hypersensitivity scores were associated with greater decreases in behaviours. *p*-values in parentheses reflect false discovery rate adjusted values for multiple comparisons across domains.

Figure 1

Effects of Terminated FCT on Sensory Hypersensitivity and Related Problem Behaviors Across Seven Modalities



Note. Figure 1 shows effects of terminated sessions of FCT on hypersensitive dimensions causing weaken level of reduction in self-injurious behaviors and self-stimulated behaviors related to seven dimensions of hypersensitivity with all chosen sense related antecedent stimuli.

Figure 2

Reduction in Tbs versus Ratio of FCT Sessions

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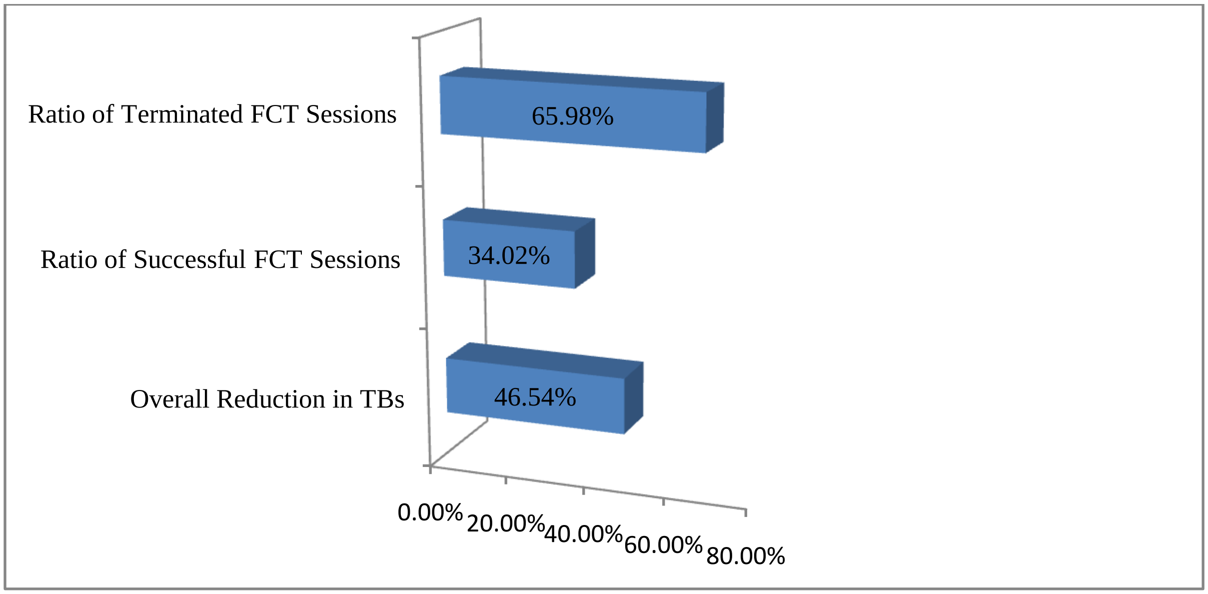

Note. Figure 2 shows overall reduction in TBs versus ratio of FCT sessions.

Discussion

The findings across all seven sensory domains revealed consistent patterns linking hypersensitivity to both self-injurious and self-stimulatory behaviours in the participant. In each domain, primary behavior was identified, accompanied by a set of secondary behaviours that frequently overlapped across senses. For self-injurious behaviours, actions such as self-biting, self-hitting, self-scratching, self-bouncing, and self-kicking repeatedly appeared as secondary responses, regardless of the sensory trigger. This repetition suggests that the participant relied on a relatively fixed repertoire of self-harming behaviours when experiencing sensory discomfort or overload, a pattern also noted by Rojahn et al. (2013) in their examination of stereotypic and injurious behaviours in individuals with developmental disabilities. A key strength of this study is its delivery in naturalistic contexts. By situating sessions in children's homes and classrooms, and by engaging caregivers as co-implementers, the intervention supported inclusion and ecological validity (Bagadood et al., 2025).

Self-stimulatory behaviours displayed domain-specific primary actions, such as moving fingers in front of the eyes (visual), tapping ears (auditory), rubbing skin (tactile), smelling objects (olfactory), licking objects (gustatory), rocking (vestibular), and finger flicking (proprioceptive), but often shared similar secondary behaviours like repetitive motor movements or object-focused actions. These results are consistent with the sensory processing literature, where domain-specific triggers have been shown to evoke both targeted and generalized repetitive responses (Ben-Sasson et al., 2009; Baranek et al., 2014). This pattern suggests that while the sensory input influences the form of the primary behaviour, the secondary behaviours may reflect broader coping strategies or sensory-seeking tendencies, aligning with Dunn's (1997) Sensory Processing Framework.

The results highlight two key insights: first, sensory hypersensitivity in different modalities tends to elicit both unique and overlapping behavioural responses; second, the persistence of certain behaviours across domains suggests a stable behavioural framework shaped by the individual's sensory processing profile. These findings reinforce the importance of interventions such as FCT, which has been shown to reduce both self-injurious and self-stimulatory behaviours by teaching alternative communication methods that address both the sensory triggers and the entrenched behavioural patterns (Tiger, Hanley, & Bruzek, 2008; Hagopian et al., 2011).

Findings of the Study

The findings indicated that terminating FCT after the set intervention period resulted in a weakened reduction of self-injurious and self-stimulated behaviours across all seven sensory hypersensitivity domains, visual, auditory, tactile, olfactory, gustatory, vestibular, and proprioceptive. While initial post-intervention data showed notable decreases in both the frequency and intensity of these behaviours, follow-up assessments revealed partial relapse, particularly in behaviours linked to primary hypersensitivity triggers. This pattern suggests that sustained intervention or ongoing reinforcement may be necessary to maintain behavioural improvements in children with hypersensitivities. Results showed a 46.54% reduction in hypersensitivity-related behaviors, with greatest improvements in visual (13.51%) and tactile (9.07%) domains. Termination weakened these effects, with partial relapse, especially in primary sensory triggers.

Conclusion

This study concluded that while FCT was effective in reducing self-injurious and self-stimulated behaviours associated with multiple sensory hypersensitivity domains, the termination of sessions led to a weakened level of behavioural improvement over time. The partial relapse observed during follow-up highlights the importance of consistent, long-term intervention and reinforcement to sustain progress. These results underscore the need for maintenance strategies and continued caregiver involvement to ensure that the gains achieved through FCT are preserved, ultimately supporting better functional and behavioural outcomes for individuals with sensory hypersensitivities.

Recommendations

To strengthen future research and improve clinical outcomes, the following recommendations are proposed:

1. Recruit larger and more demographically varied samples to enhance statistical power, allow subgroup analysis, and improve generalisability across different ASD profiles.

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2. Conduct long-term follow-up (6–12 months) to determine whether relapse patterns are temporary or persistent, thereby informing maintenance strategies.

3. Use structured post-intervention support systems such as monthly home visits, video-based fidelity scoring, and booster sessions to ensure continued adherence to FCT strategies.

4. Include interviews and observational data from parents, teachers, and therapists to identify contextual factors that influence both behaviour change and relapse.

5. Develop adaptive, domain-specific FCT modules based on each participant's most prominent sensory triggers to achieve stronger and more sustainable behaviour reduction.

6. Monitor and control for confounding factors such as medication changes, concurrent therapies, or environmental adjustments that may affect outcomes.

7. Perform direct statistical comparisons across sensory modalities to identify domains most responsive to FCT and those more prone to relapse, enabling targeted intervention planning.

8. Incorporate measures of social participation, school engagement, communication skills, and quality of life to assess the broader benefits of FCT beyond behavioural reduction.

9. Detail the structure, frequency, and duration of caregiver training, and analyse its relationship with intervention outcomes to inform best practice guidelines.

Limitations and Implications

Although some sessions were delivered in structured rooms within educational centers, deliberate steps were taken to situate FCT in natural contexts (homes, classrooms, caregiver-led routines). Future studies should expand on this by embedding supports more systematically in mainstream community environments.

Although this study was conducted in Pakistan, the findings hold broader significance for the international community, including the United States. Sensory hypersensitivity and associated challenging behaviours are widely observed among children with ASD, and interventions such as FCT demonstrate universal applicability. The low-cost, resource-adapted approach applied in this study highlights strategies that may be particularly beneficial for underfunded or rural school districts in the United States, where access to intensive behavioural services is often limited.

Moreover, the multicultural diversity of U.S. classrooms reflects some of the cultural and resource-related challenges faced by families in Pakistan. Immigrant populations, in particular, may encounter barriers to specialized services, reinforcing the need for culturally responsive adaptations of evidence-based practices. By demonstrating that FCT can be successfully adapted and remain effective in a non-Western, resource-limited setting, this study underscores the importance of flexible, globally informed intervention models. These insights provide valuable guidance for U.S. educators, policymakers, and clinicians in advancing inclusive, cost-effective, and culturally responsive supports for students with ASD.

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