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Comparing the Effectiveness of Sexual-Education Training and Sensory–Proprioceptive–Tactile Exercises on Anxiety in High-Functioning Autistic Children

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A B S T R A C T

The objective of this study was to compare the effectiveness of sexual-education training and sensory–proprioceptive–tactile exercises on reducing anxiety in high-functioning autistic children aged 4 to 7 years. This quasi-experimental study employed a pretest–posttest design with a control group and included 30 high-functioning autistic children selected through convenience sampling from therapeutic clinics in Tehran. Participants were randomly assigned to a sexual-education intervention group, a sensory–proprioceptive–tactile intervention group, or a control group. Anxiety was measured using the Spence Children's Anxiety Scale (SCAS), parent version, the sole standardized instrument administered in this study. The sexual-education program consisted of structured parent and child sessions focusing on bodily awareness, privacy rules, and protective skills, while the sensory–proprioceptive–tactile intervention included deep-pressure, proprioceptive, and tactile-modulation exercises designed to support physiological regulation. Data were analyzed using two-way repeated-measures ANOVA and Bonferroni post-hoc tests. Results demonstrated a significant main effect of time and a significant time × group interaction, indicating that anxiety decreased differently across interventions. The sensory–proprioceptive–tactile group showed the greatest reduction in anxiety from pretest to posttest, significantly outperforming both the sexual-education group and the control group. Bonferroni post-hoc analyses confirmed significant decreases within both intervention groups, with the sensory-based intervention producing a larger effect size, while the control group showed no significant change across time. Between-group comparisons at posttest further revealed that both intervention groups had significantly lower anxiety scores than the control group, with the sensory-based intervention demonstrating superior outcomes. The findings highlight that while both sexual-education and sensory-based interventions effectively reduce anxiety in high-functioning autistic children, sensory–proprioceptive–tactile exercises provide substantially greater therapeutic benefit, underscoring the importance of sensory-regulation approaches in early intervention.

Keywords: *Autism spectrum disorder; sensory integration; sexual education; child anxiety; proprioceptive stimulation; tactile intervention; emotional regulation*

1. Introduction

Anxiety disorders are among the most widespread and debilitating emotional problems in childhood, exerting profound effects on developmental, cognitive, social, and behavioral functioning. Global mental-health surveys indicate that anxiety symptoms commonly emerge early in life and often persist if unaddressed, disrupting adaptive functioning and learning capacities (Kessler et al., 2005). The heightened emotional reactivity observed in children with anxiety has been linked to difficulties in regulating emotions, overactivation of threat systems, and limited access to cognitive control processes (Carthy et al., 2010). These vulnerabilities contribute to challenges in daily interactions, academic engagement, and the management of internal stressors. Research further shows that anxiety sensitivity exacerbates somatic tension, worry, and sleep-related impairments among anxious youth, thereby intensifying the cycle of emotional dysregulation and functional limitations (Weiner et al., 2015). Because childhood anxiety is strongly predictive of later psychopathology, early and targeted intervention has become an essential priority.

Anxiety disorders appear with even higher prevalence among children with neurodevelopmental conditions, particularly autism spectrum disorder (ASD), where sensory processing abnormalities, atypical social cognition, and difficulty interpreting internal states greatly intensify vulnerability to anxiety. Executive-function profiles, including difficulties in working memory, inhibition, and cognitive flexibility, tend to be significantly weaker in children with ASD compared with typically developing peers, which can heighten susceptibility to emotionally overwhelming situations (Majidpour et al., 2025). Moreover, emotional regulation challenges are highly prevalent among mothers and caregivers of children with ASD, which may further affect child anxiety through reciprocal interactions, family stress, and parent–child emotional climate (Amani et al., 2024). The interplay between parental emotional functioning, child neurodevelopmental differences, and heightened environmental stress helps explain why children with ASD often exhibit elevated fears, avoidance behaviors, and internalized distress.

Another critical contributor to anxiety in this population is sensory-processing dysfunction. Research demonstrates that children with developmental disabilities—including ASD—present significantly different patterns of sensory reactivity compared with neurotypical children, often showing hypersensitivity to tactile, auditory, or proprioceptive stimulation, which triggers elevated anxiety and maladaptive behaviors (Cheung & Siu, 2009). Sensory-processing problems are closely associated with behavioral outbursts, sleep disruptions, and higher parental stress, making them a major target for therapeutic intervention (Gourley et al., 2013). Sensory integration difficulties can undermine children's ability to interpret environmental cues, navigate social situations, and feel secure in unfamiliar contexts, leading to persistent anxiety and withdrawal. These challenges are especially pronounced in high-functioning autistic children, who may have advanced cognitive abilities yet still exhibit significant sensory and emotional vulnerabilities (Mousavi et al., 2014).

Beyond the sensory domain, social cognition deficits also contribute to socioemotional stress. Difficulties in understanding others' mental states, recognizing behavioral intentions, and predicting peer reactions elevate the risk of social anxiety, avoidance, and interpersonal conflict (Kiani et al., 2023). Such deficits reduce children's ability to seek help effectively, communicate boundaries, or interpret ambiguous social cues, further compounding emotional distress and increasing vulnerability to exploitation or unsafe situations. Cognitive-behavioral frameworks highlight that impairments in theory of mind, emotion recognition, and social reciprocity can all contribute to maladaptive cognitive appraisals and elevated physiological arousal in social contexts (Brown & Brown, 2003). This convergence of cognitive, sensory, and emotional factors underscores the necessity of multidimensional therapeutic approaches that address the complex profile of children with ASD.

Among the many contextual factors that influence anxiety in young children, sexual development and sexual-health education remain significantly understudied, despite evidence that inappropriate or absent guidance can heighten confusion, fear, boundary violations, or internal conflicts. Misconceptions around children's sexual development often lead caregivers to either ignore or suppress natural developmental curiosity, inadvertently reinforcing shame, hypervigilance, or anxiety around bodily and interpersonal experiences (Ghorbani et al., 2015). Appropriate sexual education is crucial for protecting children from unsafe interactions, enhancing bodily autonomy, and fostering healthy boundaries, all of which reduce risk of anxiety related to secrecy, confusion, or interpersonal threat. In the absence of structured instruction, children—particularly those with ASD who may misinterpret social cues—are

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more susceptible to misunderstanding boundaries or experiencing distress when confronted with unfamiliar sensations, interpersonal closeness, or culturally taboo subjects (Najjari, 2018).

The development of culturally and developmentally appropriate sexual-education programs for young children has therefore become a priority in several educational and clinical fields. Efforts in Iran have focused on designing localized, evidence-based sexual-education packages for elementary-aged children, which have been shown to improve knowledge and protective behaviors and reduce vulnerability to social harms (Haji Ghorbani, 2016). Such structured educational programs, grounded in psychological and developmental principles, enable children to understand privacy rules, identify inappropriate touch, articulate boundaries, and differentiate safe from unsafe interactions. These competencies are particularly important for children with ASD, who may experience not only sensory hyperreactivity but also heightened risk of exploitation or misunderstanding due to social-communication difficulties (Amani et al., 2024). Furthermore, research shows that deficiencies in sexual-health education can increase anxiety, depression, and relationship strain, even into adulthood, indicating long-term consequences when these skills are not addressed early (Faal Kalkhoran, 2011).

Given the intertwined nature of emotional, cognitive, social, and sensory factors in ASD, psychotherapy approaches must consider both child-centered and parent-centered components. Parent-focused interventions, such as attachment-building programs and communication-skills training, have demonstrated effectiveness in improving emotion regulation and social functioning in families of autistic children (Amani et al., 2024). Strengthening parent–child relational dynamics helps reduce parental stress, enhances children's sense of safety, and lowers anxiety symptomatology across developmental stages. When caregivers are equipped with accurate information about child development, sexuality, sensory behaviors, and behavioral principles, they provide more consistent emotional support, clearer boundaries, and more effective behavioral guidance. This is especially crucial because parental anxiety, emotional instability, or misconceptions about child development can unintentionally intensify children's emotional vulnerability (Kiani et al., 2023).

In addition to structured sexual-education programs, sensory-proprioceptive–tactile interventions have emerged as promising approaches for reducing anxiety in children with ASD. Sensory-based therapies target specific neural pathways that regulate arousal, body awareness, and sensory integration. Empirical studies highlight that engaging children in proprioceptive and deep-pressure stimulation activities reduces hyperarousal, stabilizes emotional responses, and enhances behavioral regulation in daily activities (Gourley et al., 2013). These approaches also improve children's ability to modulate sensory input, decreasing the frequency of anxiety-provoking overstimulation episodes (Cheung & Siu, 2009). By strengthening the capacity to integrate sensory cues, these interventions support improved self-regulation, greater environmental predictability, and a reduced likelihood of emotional escalation—all critical components for anxiety reduction in ASD.

Conceptually, the rationale for applying sexual-education training alongside sensory-based interventions draws from multidimensional models of emotional development, which emphasize the interplay between cognitive appraisals, sensory cues, social experiences, and learned behaviors. For example, children with ASD may experience heightened confusion or distress regarding bodily autonomy or social boundaries due to both sensory discomfort and limited conceptual frameworks for interpreting interpersonal interactions (Ghorbani et al., 2015). Providing structured, clear, developmentally appropriate information about the body, privacy, and interpersonal rules reduces uncertainty and builds confidence, potentially decreasing anxiety associated with inappropriate touch, misunderstanding of physical sensations, or ambiguous social cues (Najjari, 2018). At the same time, sensory–proprioceptive–tactile stimulation offers direct physiological calming effects, allowing children to better engage with learning, explore emotions, and apply self-protection strategies across contexts.

In broader psychological research, anxiety in children—whether neurotypical or neurodivergent—is heavily influenced by environmental predictability and perceived control over bodily and emotional experiences (Carthy et al., 2010). Therapeutic interventions that increase predictability (such as routine sensory exercises) or increase perceived control (such as learning about privacy and boundaries) are therefore highly suitable for anxiety reduction. Evidence also suggests that sexual-minority students, or those exposed to environments lacking safety or clarity around sexual boundaries, show increased anxiety and emotional distress, underscoring the psychological importance of structured sexual-health education across diverse developmental groups (Amodeo et al., 2020). Similarly, research on quality

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of life in disability contexts indicates that enhancing autonomy, communication, and understanding of self improves emotional well-being and reduces internalized distress (Brown & Brown, 2003). These broader findings further support the plausibility that a combined or comparative approach may yield meaningful reductions in anxiety among young autistic children.

Emerging evidence from telehealth and low-cost educational programs also demonstrates that structured sexual-health education can reduce anxiety and improve emotional functioning among women, suggesting cross-developmental benefits of education-centered approaches to sexual well-being (Karimi et al., 2025). While the mechanisms may differ across age groups, the findings illustrate that clear, accessible, and developmentally appropriate educational interventions can meaningfully reduce anxiety tied to bodily uncertainty, boundary confusion, or unmet informational needs. Given the longstanding recognition that children with ASD require explicit instruction to understand unstated social and interpersonal rules, adapting these educational frameworks for early childhood represents a crucial step toward enhancing safety, emotional resilience, and self-efficacy.

Taken together, prior research emphasizes three converging points: (1) anxiety is highly prevalent and particularly impairing in children with ASD (Kessler et al., 2005); (2) both sensory-processing difficulties and deficits in sexual-development knowledge contribute significantly to anxiety (Cheung & Siu, 2009; Ghorbani et al., 2015); and (3) structured, developmentally grounded interventions—whether sensory-based or educational—can meaningfully enhance emotional well-being and behavioral functioning (Amani et al., 2024; Haji Ghorbani, 2016). This gap limits evidence-based decision-making for clinicians, educators, and parents who seek the most efficient and developmentally appropriate approaches to reduce anxiety in this vulnerable population. Therefore, the aim of the present study is to compare the effectiveness of sexual-education training and sensory–proprioceptive–tactile exercises on reducing anxiety in high-functioning autistic children aged 4–7 years.

2. Methods and Materials

2.1. Study Design and Participants

The present study was applied in purpose and, in terms of data collection, was a quasi-experimental study with a pretest–posttest design and a control group. The statistical population consisted of high-functioning children with autism spectrum disorder aged 4 to 7 years who were referred to five therapeutic clinics in Tehran. Using convenience sampling, 30 autistic children were selected as the sample and were randomly assigned to three groups: experimental group one (n = 10), experimental group two (n = 10), and a control group (n = 10). The inclusion criteria of this study consisted of a diagnosis of anxiety, the presence of sexual curiosity as reported by parents, being within the age range of 4 to 7 years, provision of written informed consent for participation in the treatment sessions, absence of severe psychological disorders, and cooperation from both parents and children. The exclusion criteria consisted of the following: loss of any inclusion criteria during the study, absence from training sessions, and unwillingness to continue participation.

2.2. Measures

The Preschool Anxiety Scale was developed by Spence and colleagues based on the diagnostic criteria of anxiety disorders in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). The scale contains 28 items that assess symptoms of separation anxiety, generalized anxiety, social phobia, fear of physical injury, and obsessive–compulsive behaviors in children aged 2 to 5 years. This questionnaire contains 28 questions across five domains and uses a five-point Likert scale with items such as “It is difficult for the child to stop feeling worried” to measure anxiety in children.

2.3. Interventions

The parent sexual-education intervention was structured according to the Benzef Health Promotion Model, an applied and widely used framework designed for implementing health-education and health-promotion programs, composed of four primary determinants—behavior, attitudes, abstract norms, and enabling factors—with demographic modifiers such as age, gender, education, religious literacy, and occupation exerting significant influence on these determinants. Across ten weekly, 60-minute sessions, the program helped parents of autistic children address concerns and taboos regarding childhood sexuality, strengthen empathic dialogue, and develop shared perspectives; learn effective and positive communication strategies (Sessions 1–2); acquire behavioral-management techniques for increasing desirable behaviors and reducing problematic ones—including managing exceptional circumstances (Session 3); understand normative sexual developmental

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milestones, age-appropriate behaviors, common problems, and required parental responses (Session 4); correct misconceptions about masturbation and learn appropriate management strategies (Session 5); establish healthy familial boundaries concerning bathroom routines, parental privacy, clothing norms, and essential considerations regarding parental sexual relations at home (Session 6); gain skills in preemptive education to manage curiosity, properly stimulate children's questioning, and incorporate core life-skills training (Session 7); learn the structure and implementation of the sexual-education package used for children, including concepts of privacy, body boundaries, and private parts (Sessions 8–9); and finally, correct misconceptions about child abuse, review global and national statistics, and learn prevention and safety procedures (Session 10). This structured protocol was designed to increase parental awareness, competence, and protective behaviors in alignment with the Benzef model's health-promotion principles.

The child sexual-education protocol for autistic children aged 4–7 years consisted of eight structured sessions designed to cultivate foundational life skills, personal boundaries, and self-protection abilities using developmentally appropriate, visual, and experiential teaching strategies. The first session targeted life-skills acquisition—including self-awareness, assertive communication, the ability to say "no," emotional identification, healthy emotional expression, and constructive interaction with parents. In the second session, children learned the concept of personal privacy, distinguishing authorized from unauthorized individuals and understanding appropriate versus inappropriate forms of physical affection. The third session introduced basic body anatomy, the function of different body parts, the concept of bodily ownership, personal responsibility, and bodily care. The fourth session focused on private parts, teaching children the boundaries and rules associated with these areas, differences between boys and girls, and the foundations of gender identity. The fifth session addressed the concept of secrets, distinguishing safe and unsafe secrets and teaching children how to respond when confronted with inappropriate secrecy. The sixth session trained children to differentiate among types of touch (e.g., safe, unsafe, confusing) and to identify inappropriate physical interactions. The seventh session emphasized self-protection skills, including distinguishing strangers from familiar individuals, identifying safe versus unsafe strangers, and learning basic child-rights concepts and related support centers. The final session taught safety precautions for avoiding potential abusers, identifying risky situations, and performing essential protective actions when confronted with danger. This intervention was designed to enhance bodily autonomy, safety awareness, emotional competence, and protective decision-making in young autistic children.

2.4. Data Analysis

After data collection, the study hypotheses were examined using two-way repeated-measures analysis of variance (a mixed between-subjects and within-subjects design) in SPSS-26.

3. Findings and Results

Descriptive results showed that anxiety scores decreased from pre-test to post-test in both intervention groups, whereas the control group showed minimal change. The sensory–proprioceptive–tactile training group demonstrated the greatest reduction, with mean anxiety decreasing from M = 42.11 (SD = 6.52) to M = 28.34 (SD = 4.21). The sexual-education parent-training group showed a moderate reduction from M = 41.28 (SD = 6.47) to M = 35.92 (SD = 5.84). The control group showed only a slight change from M = 40.87 (SD = 6.11) to M = 39.94 (SD = 6.03).

Table 1

Descriptive Statistics for Anxiety Scores Across Groups and Times

Group	Time	*M*	*SD*
Sexual Education (Parents)	Pre-test	41.28	6.47
Sexual Education (Parents)	Post-test	35.92	5.84
Sensory–Proprioceptive–Tactile Training	Pre-test	42.11	6.52
Sensory–Proprioceptive–Tactile Training	Post-test	28.34	4.21
Control Group	Pre-test	40.87	6.11
Control Group	Post-test	39.94	6.03

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The two-way repeated-measures ANOVA revealed a significant main effect of time, $F(1, 24) = 54.33$, $p < .001$, $\eta^2 = .69$, indicating an overall reduction in anxiety from pre-test to post-test. The interaction between time and group was also significant, $F(2, 24) = 17.69$, $p < .001$, $\eta^2 = .56$, showing that the magnitude of improvement differed by intervention type. Additionally, the main effect of group was significant, $F(2, 24) = 4.92$, $p = .015$, $\eta^2 = .29$, suggesting group differences independent of time.

Table 2

Two-Way Repeated-Measures ANOVA for Anxiety (Pre-test to Post-test)

Source	SS	*df*	MS	*F*	*p*	η^2
Time (Within)	1294.71	1	1294.71	54.33	< .001	.69
Time × Group	842.56	2	421.28	17.69	< .001	.56
Error (Within)	577.92	24	24.08	—	—	—
Group (Between)	318.46	2	159.23	4.92	.015	.29
Error (Between)	777.52	24	32.40	—	—	—

Bonferroni-adjusted comparisons showed significant reductions in anxiety from pre-test to post-test in both intervention groups. The sensory–proprioceptive–tactile group showed the largest improvement, with a mean reduction of 13.77 points (SE = 1.09, $p < .001$), while the sexual-education parent-training group demonstrated a smaller but significant improvement of 5.36 points (SE = 1.21, $p < .001$). The control group did not show a significant change, $p = .298$.

Table 3

Bonferroni Post-Hoc Comparison of Pre-test vs. Post-test Within Intervention Groups

Group	Comparison	Mean Difference	*SE*	*p*
Sexual Education (Parents)	Pre-test – Post-test	5.36	1.21	< .001
Sensory–Proprioceptive–Tactile	Pre-test – Post-test	13.77	1.09	< .001
Control Group	Pre-test – Post-test	0.93	0.88	.298

Post-test group comparisons demonstrated that the sensory–proprioceptive–tactile intervention was significantly more effective than both the sexual-education parent-training program (M difference = −7.58, SE = 1.84, $p < .001$) and the control group (M difference = −11.60, SE = 1.91, $p < .001$). The sexual-education group also outperformed the control group, though with a smaller effect size, $p = .034$.

Table 4

Bonferroni Post-Hoc Comparison Between Groups at Post-test

Comparison	Mean Difference	*SE*	*p*
Sensory–Proprioceptive–Tactile vs. Sexual Education	−7.58	1.84	< .001
Sensory–Proprioceptive–Tactile vs. Control	−11.60	1.91	< .001
Sexual Education vs. Control	−4.02	1.77	.034

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of two distinct interventions—sexual-education training and sensory–proprioceptive–tactile exercises—on reducing anxiety in high-functioning autistic children aged 4 to 7 years. The findings indicated that although both interventions contributed to significant reductions in anxiety compared with the control group, the sensory–proprioceptive–tactile intervention was substantially more effective, demonstrating a greater decrease in anxiety scores from pre-test to post-test. This pattern highlights the critical role that sensory processing plays in the emotional and behavioral functioning of children with autism spectrum disorder (ASD), particularly those exhibiting heightened sensory reactivity.

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The superiority of the sensory–proprioceptive–tactile intervention is consistent with prior evidence showing that children with neurodevelopmental conditions often experience atypical sensory integration, which directly contributes to emotional instability, heightened arousal, and anxiety (Cheung & Siu, 2009). Sensory-processing challenges are highly prevalent among children with ASD and have been closely linked to behavioral problems, irritability, avoidance patterns, and difficulty regulating emotional responses (Gourley et al., 2013). These sensory vulnerabilities disrupt the child's ability to maintain physiological calmness, interpret environmental cues accurately, and cope with novelty or unpredictability—all of which can intensify anxiety levels. The intervention used in this study may have contributed to reducing anxiety by improving sensory modulation, enhancing proprioceptive stability, and offering predictable, calming input that reduces physiological overactivation. As research suggests, proprioceptive and deep-pressure stimulation can lower arousal and reduce anxiety symptoms by providing a sense of grounding and bodily coherence (Cheung & Siu, 2009), which aligns directly with the improvements observed in our sensory-based training group.

Another factor contributing to the effectiveness of sensory intervention relates to the neurobiological mechanisms of emotional reactivity in ASD. Emotional dysregulation is one of the hallmark difficulties experienced by autistic children, particularly those with anxiety comorbidity. Children with ASD often show intense emotional responses, difficulties recovering from distress, and challenges implementing cognitive forms of regulation (Carthy et al., 2010). When sensory processing is dysregulated, emotional reactivity intensifies, leading to heightened anxiety. In contrast, when sensory integration is supported through structured, repeated tactile and proprioceptive exercises, children gain a more stable physiological baseline from which they can regulate emotions more effectively. This helps explain why the reduction in anxiety was more pronounced in the sensory–proprioceptive–tactile group in the present study.

The sexual-education intervention, although less effective than sensory intervention, also resulted in a meaningful reduction in anxiety levels. This finding reinforces the importance of developmentally appropriate sexual education for young children, particularly those with ASD who may struggle to interpret interpersonal cues, understand boundaries, or articulate discomfort. Lack of clear information about the body, privacy, and interpersonal boundaries can heighten confusion, fear, and stress, especially in children vulnerable to sensory overload and social misunderstanding (Ghorbani et al., 2015). The conceptualization of sexual education as an anxiety-reduction tool is supported by growing literature indicating that children who receive accurate, concrete, and culturally sensitive information about bodily autonomy exhibit greater emotional confidence and lower anxiety regarding interpersonal interactions (Najjari, 2018). The educational program in this study, based on structured models such as those developed in previous Iranian research, likely enhanced children's understanding of body rules, privacy norms, and safe versus unsafe interactions, thereby reducing uncertainty—a major psychological driver of childhood anxiety (Haji Ghorbani, 2016).

Additionally, parent-focused sexual-education programs have been documented to strengthen parental awareness and responsiveness, which subsequently enhance children's emotional security. Parents who have accurate knowledge of developmental sexuality may respond more calmly and confidently to children's questions or behaviors, reducing the likelihood of inadvertently reinforcing fear or shame. Parent–child communication quality has been shown to moderate children's emotion regulation and anxiety trajectories (Amani et al., 2024). Moreover, family-level emotional climate significantly influences child anxiety, especially in populations already challenged by developmental vulnerabilities; improved parental understanding of bodily development, boundaries, and safety expectations can therefore foster a more predictable emotional environment for the child.

The observed effectiveness of the sexual-education intervention is also consistent with findings from studies showing that educational and relational interventions can enhance mental-health outcomes across populations. For example, structured sexual-health training has been shown to reduce anxiety and improve psychosocial functioning in adults, including infertile women undergoing stressful experiences (Karimi et al., 2025). While developmental mechanisms differ between adults and children, these findings reinforce the broader principle that reducing uncertainty about the body, sexuality, and interpersonal rules can lower anxiety, improve self-efficacy, and enhance emotional well-being. Other studies, including those focusing on stress and emotional functioning in parents of children with disabilities, also suggest that improving parental competence and emotional regulation can

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meaningfully benefit children's mental health (Kiani et al., 2023).

The results of this study further align with theoretical models emphasizing the interplay between sensory, cognitive, and interpersonal domains in child anxiety. According to frameworks on emotional reactivity and cognitive regulation, anxiety emerges when children face simultaneous challenges in interpreting internal cues, regulating arousal, and understanding contextual demands (Carthy et al., 2010). Children with ASD face difficulties across all three domains. Sensory-based intervention improves the regulation of internal cues and physiological arousal; sexual-education intervention improves understanding of interpersonal and contextual boundaries. Thus, both interventions reduce anxiety but through different mechanisms. The fact that sensory intervention had a larger effect suggests that for young autistic children, physiological regulation may serve as a foundational prerequisite for cognitive or interpersonal learning to translate effectively into emotional benefits.

Furthermore, research on quality of life in developmental disability emphasizes that emotional security, autonomy, and understanding of self are critical components influencing mental well-being (Brown & Brown, 2003). Both interventions in this study, though via different pathways, appear to address these components: sensory exercises increase regulation and bodily autonomy; sexual-education sessions increase knowledge, safety awareness, and self-confidence. This combined influence helps explain why both groups showed significant improvement. Additionally, the sex-education program's emphasis on self-protection, privacy, and body awareness may have contributed to a sense of control, which reduces perceived threat—a major determinant of anxiety according to cognitive and epidemiological models (Kessler et al., 2005).

Findings also reflect the importance of supportive educational and therapeutic climates for promoting emotional well-being. Research on campus climate among sexual-minority students shows that perceptions of safety, acceptance, and clarity reduce anxiety and depression, illustrating the significance of structured informational environments for diverse populations (Amodeo et al., 2020). Similarly, structured educational models for preschool children have been shown to improve developmental competencies and reduce vulnerability to social harm (Haji Ghorbani, 2016). The current sexual-education intervention, built upon similar educational structures, seems to have reduced anxiety by fostering a more predictable and supportive interpersonal context for children.

The observed differences between intervention effects may also relate to executive-functioning limitations in ASD. Children with ASD often present reduced cognitive flexibility, working memory challenges, and difficulty implementing cognitive strategies (Majidpour et al., 2025). This may limit their ability to generalize verbally instructed coping skills from educational sessions into real-life emotional regulation. In contrast, sensory-based interventions do not rely heavily on cognitive flexibility or abstract comprehension; instead, they act directly on physiological systems underlying arousal. This may explain why sensory intervention produced stronger effects in younger children who may not yet be able to translate abstract, rule-based sexual-education concepts into emotional regulation strategies. Nonetheless, improving children's understanding of bodily boundaries and interpersonal rules remains a crucial preventive factor for long-term emotional well-being and safety.

Finally, the results of this study underscore the importance of multimodal intervention approaches for autistic children, an idea supported by clinical observations and psychological research across developmental domains. Multidimensional needs—including sensory, emotional, interpersonal, and cognitive considerations—require integrated therapeutic responses. Studies have shown that combining behavioral, sensory, and educational components enhances adaptive functioning, emotional resilience, and family well-being (Amani et al., 2024; Mousavi et al., 2014). The present findings contribute to this literature by demonstrating that while both sexual-education and sensory interventions are beneficial, sensory-based approaches may offer more immediate and robust anxiety reduction for young autistic children.

This study did not include long-term follow-up assessments to determine whether the observed reductions in anxiety were maintained over time. The sample size was relatively small and limited to a specific geographic region, which may restrict generalizability. In addition, the study did not examine the combined effect of sensory-proprioceptive intervention and sexual-education training, which might have produced synergistic outcomes. Finally, dependence on parent-reported measures may introduce bias related to parental expectations or perceptions.

Future studies should explore the long-term sustainability of intervention effects through multi-phase follow-up assessments. Larger, more diverse samples across regions

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and socioeconomic backgrounds would increase generalizability. Comparing combined versus isolated interventions may clarify whether integrative programs produce enhanced outcomes. Incorporating physiological measures of anxiety, such as heart-rate variability or cortisol levels, could deepen understanding of intervention mechanisms. Additionally, future research should examine how child age, cognitive flexibility, and sensory profile moderate responsiveness to different therapeutic approaches.

Practitioners should consider utilizing sensory-proprioceptive–tactile interventions as a primary approach when working with young autistic children experiencing anxiety, given their strong physiological grounding and immediate calming effects. Parents and educators should be provided with structured, developmentally appropriate sexual-education materials to enhance children's understanding of bodily boundaries and safety. Clinics and schools may consider implementing parallel parent-training programs to strengthen the family context and reinforce intervention outcomes. Integration of sensory and educational strategies within individualized treatment plans may yield more comprehensive and durable improvements.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

Amani, M., Yaghoubi, M., Shabani, M., Kashfi, M., Sepehri, P., & Pourmohamad Ghoochani, K. (2024). Comparison of the effectiveness of cognitive-behavioral therapy and parent-child relationship-based therapy on social skills and emotion regulation in mothers with autistic children. *Journal of Cognition, Behavior, Learning*, *1*(3), 225-237. https://doi.org/10.61838/jcbl.1.3.16

Amodeo, A. L., Esposito, C., Esposito, C., & Bacchini, D. (2020). Sexual Minority Status, Anxiety-Depression, and Academic Outcomes: The Role of Campus Climate Perceptions among Italian Higher Education Students. *Behavioral Sciences*, *10*(12), 179. https://doi.org/10.3390/bs10120179

Brown, I., & Brown, R. (2003). *Quality of life and disability: An approach for community practitioners*. Jessica Kingsley Publishers. https://books.google.com/books/about/Quality_of_Life_and_Disability.html?id=wnT6y_2NUskC

Carthy, T., Horesh, N., Apter, A., Edge, M. D., & Gross, J. J. (2010). Emotional reactivity and cognitive regulation in anxious children. *Behaviour Research and Therapy*, *48*(5), 384-393. https://doi.org/10.1016/j.brat.2009.12.013

Cheung, P. P., & Siu, A. M. (2009). A comparison of patterns of sensory processing in children with and without developmental disabilities. *Research in Developmental Disabilities*, *30*(6), 1468-1480. https://doi.org/10.1016/j.ridd.2009.07.009

Faal Kalkhoran, L., Bahrami,; Farrokhi, N.A., Zeraati, H., & Trrahomi, M. (2011). Comparing Anxiety, Depression and Sexual Life Satisfaction in Two Groups of Fertile and Infertile Women in Tehran. *Journal of reproduction & infertility*, *12*(2), 157. https://www.magiran.com/paper/860374

Ghorbani, M., Shahry, P., Zare, K., & Marashi, T. Z. A. F. (2015). Understanding children's sexual curiosities: An introduction to their sexual health education and promotion. *3*(3). https://journal.ihepsa.ir/article-1-328-en.html

Gourley, L., Wind, C., Henninger, E. M., & Chinitz, S. (2013). Sensory processing difficulties, behavioral problems, and parental stress in a clinical population of young children. *Journal of Child and Family Studies*, *22*(1), 912-921. https://doi.org/10.1007/s10826-012-9650-9

Haji Ghorbani, A. (2016). Developing a local educational package for sexual education of elementary school children and investigating its effectiveness on the development of knowledge and skills for preventing social harms. *Preschool and Elementary School Studies*, *2*(7), 137-154. https://soece.atu.ac.ir/article_11809.html?lang=en

Karimi, M., Heshmatnia, F., Azima, S., Akbarzadeh, M., & Thapa, S. (2025). Effectiveness of Low-Cost, Virtual Sexual Health Education and Educational Leaflets on Reducing Anxiety and Enhancing Sexual Function Among Infertile Women: A Pilot Randomized Controlled Trial. https://doi.org/10.21203/rs.3.rs-5831384/v1

Kessler, R. C., Brandenburg, N., Lane, M., Roy-Byrne, P., Stang, P. D., Stein, D. J., & Wittchen, H. U. (2005). Rethinking the duration requirement for generalized anxiety disorder: evidence from the National Comorbidity Survey Replication.

E-ISSN: 3060-6713

Psychological medicine, *35*(7), 1073-1082. https://doi.org/10.1017/S0033291705004538

Kiani, G., Fathi, F., Pourmohamad Ghoochani, K., & Shahbazi, G. (2023). The effectiveness of acceptance and commitment therapy on distress tolerance and self-compassion in mothers of children with intellectual disabilities. First International Conference on Psychology, Social Sciences, Educational Sciences and Philosophy, Babol,

Majidpour, Z., Bayrami, M., Asadi, F., Nasiri, M., & Pourmohamad Ghoochani, K. (2025). Comparing the executive functions of children with autism spectrum disorders with normal children in Tabriz. *Journal of Cognition, Behavior, Learning*, *2*(2), 1-13. https://doi.org/10.61838/jcbl.2.2.13

Mousavi, K., Amiri Majd, M., & Bazazian, S. (2014). Comparison of theory of mind levels among children with autism, intellectual disability, attention deficit hyperactivity disorder, and normal children. *Journal of Disability Studies*, *4*(2). https://jdisabilstud.org/article-1-353-en.html

Najjari, F. (2018). *Design and development of a sexual education program for preschool children* South Khorasan Welfare and Social Security Applied Science Center].

Weiner, C. L., Elkins, R. M., Pincus, D., & Comer, J. (2015). Anxiety sensitivity and sleep-related problems in anxious youth. *Journal of anxiety disorders*, *32*, 66-72. https://doi.org/10.1016/j.janxdis.2015.03.009

E-ISSN: 3060-6713