


Impact of Sandplay Therapy in Reducing Self-Handicapping Behaviors and Improving the Quality of Life in Children with Autism Spectrum Disorder (ASD)

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ABSTRACT

This study aimed to examine the effectiveness of Sandplay Therapy in reducing self-handicapping behaviors and improving the quality of life in children with autism spectrum disorder (ASD). A randomized controlled trial was conducted with 30 children diagnosed with ASD, who were randomly assigned to either the experimental group (n = 15) receiving Sandplay Therapy or the control group (n = 15) receiving no intervention. The intervention consisted of eight 90-minute sessions conducted over eight weeks. Self-handicapping behaviors were measured using the Self-Handicapping Scale (SHS), and quality of life was assessed using the Pediatric Quality of Life Inventory (PedsQL), both of which demonstrated established validity and reliability. Assessments were conducted at pre-test, post-test, and five-month follow-up. Data were analyzed using repeated-measures ANOVA, with post-hoc comparisons conducted using the Bonferroni test. The results indicated a significant reduction in self-handicapping behaviors in the experimental group from pre-test (M = 42.85, SD = 4.31) to post-test (M = 31.76, SD = 3.76) and further at follow-up (M = 29.45, SD = 3.45), while no significant changes were observed in the control group. Similarly, quality of life improved significantly in the experimental group, with scores increasing from pre-test (M = 52.12, SD = 5.12) to post-test (M = 63.45, SD = 4.78) and follow-up (M = 67.32, SD = 4.50), whereas the control group remained stable. ANOVA results confirmed significant main effects of time and group, as well as a significant interaction effect ($p < 0.05$). Bonferroni post-hoc comparisons indicated that improvements were sustained at follow-up. Sandplay Therapy is an effective intervention for reducing self-handicapping behaviors and enhancing the quality of life in children with ASD, with sustained benefits observed at follow-up. These findings highlight the potential of nonverbal, expressive therapies in supporting emotional regulation and adaptive functioning in children with ASD.

Keywords: Sandplay Therapy, Autism Spectrum Disorder, Self-Handicapping, Quality of Life, Randomized Controlled Trial, Psychological Intervention.

A 1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by persistent deficits in social

communication and repetitive behaviors, often accompanied by difficulties in emotional regulation and adaptive functioning. Children with ASD frequently experience self-handicapping behaviors, which involve creating obstacles to success in order to protect self-esteem, as well as reduced quality of life due to challenges in social integration and emotional well-being (Yuxi et al., 2024). Addressing these challenges requires effective therapeutic interventions that facilitate emotional expression and social development. Among various therapeutic approaches, Sandplay Therapy has emerged as a promising method for enhancing emotional regulation and psychological well-being in children with ASD (Khalid et al., 2024).

Sandplay Therapy, originally developed within the framework of Jungian psychology, is a nonverbal, projective therapy that allows individuals to externalize inner conflicts and emotions through symbolic representation in a structured play environment (Kalff, 2024). This method is particularly beneficial for children with ASD, who often struggle with verbal communication and emotional articulation (LeBel, 2024). By engaging with miniature figures in a sandbox, children can construct meaningful scenes that reflect their psychological states, facilitating self-awareness and emotional processing (Zelcek & Pouya, 2024). Research has demonstrated that Sandplay Therapy promotes psychological resilience and social adaptation, making it a suitable intervention for addressing self-handicapping behaviors and improving quality of life in children with ASD (Rong-shuang & Zhou, 2023).

Self-handicapping is a cognitive and behavioral strategy in which individuals intentionally create obstacles to performance in order to protect their self-image from potential failure (Kim & Seong, 2023). This phenomenon is particularly prevalent among children with ASD, who often experience anxiety and fear of negative evaluation in social and academic settings (Wiersma et al., 2022). Previous studies have indicated that self-handicapping behaviors are closely linked to emotional dysregulation, low self-esteem, and learned helplessness (Hong & Kim, 2022). Interventions that foster self-awareness and emotional regulation, such as Sandplay Therapy, may provide children with ASD the necessary tools to break this cycle and develop more adaptive coping mechanisms (Freedle, 2022). The effectiveness of Sandplay Therapy in reducing self-handicapping behaviors has been documented in various studies, with findings suggesting that the non-directive nature of the therapy encourages self-exploration and enhances problem-solving skills (Ammann, 2022).

Quality of life is another critical factor influencing the overall well-being of children with ASD, encompassing physical, emotional, and social domains. Due to difficulties in social interactions and emotional regulation, children with ASD often experience lower quality of life compared to their neurotypical peers (Zhao & Chen, 2021). Effective therapeutic interventions should aim to enhance their social engagement, emotional resilience, and overall life satisfaction (Tan et al., 2021). Sandplay Therapy has been found to be particularly effective in fostering self-expression and reducing emotional distress in children facing psychological challenges (Olaniyi et al., 2021). By providing a structured yet flexible environment for symbolic play, Sandplay Therapy enables children to explore and integrate their emotions, leading to improved emotional well-being and social functioning (Kim et al., 2021).

Several empirical studies have supported the effectiveness of Sandplay Therapy in improving emotional and behavioral outcomes in children. For instance, a meta-analysis on Sandplay Therapy interventions found significant reductions in emotional distress and behavioral problems across various clinical populations (Wiersma et al., 2022). Additionally, research has shown that Sandplay Therapy can enhance self-regulation and cognitive flexibility, skills that are essential for reducing self-handicapping behaviors (Troudart, 2020). In a randomized controlled trial comparing Sandplay Therapy with cognitive-behavioral therapy (CBT), both interventions were found to be effective in reducing anxiety and improving emotional well-being, but Sandplay Therapy demonstrated a unique advantage in facilitating nonverbal emotional processing (Matta & Ramos, 2023).

One of the key mechanisms underlying the effectiveness of Sandplay Therapy is its ability to promote neural integration and cognitive-emotional processing. Neuroscientific research has demonstrated that engaging in symbolic play activates neural circuits associated with emotional regulation and self-reflection, supporting psychological growth and resilience (Cunningham, 2020). Studies utilizing neuroimaging techniques have revealed increased activity in brain regions associated with emotional processing following Sandplay Therapy sessions, suggesting that this intervention facilitates neural plasticity and adaptive emotional responses (Yeo Ho Soo Ah, 2019). This study aims to examine the effectiveness of Sandplay Therapy in reducing self-handicapping behaviors and improving the quality of life in children with ASD, providing further empirical support for its therapeutic applications.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a randomized controlled trial (RCT) design to investigate the effectiveness of Sandplay Therapy on self-handicapping and quality of life in children with autism spectrum disorder (ASD). Participants were recruited from autism therapy centers and special education schools, with inclusion criteria requiring a formal ASD diagnosis, an age range of 7 to 12 years, and no concurrent psychological or pharmacological treatments that could influence the outcomes. A total of 30 children who met the criteria were randomly assigned to either the experimental group ($n = 15$), which received Sandplay Therapy, or the control group ($n = 15$), which received no intervention. The intervention was conducted over eight 90-minute sessions, with one session per week. To assess the long-term effects of the therapy, a five-month follow-up was conducted, during which participants in both groups completed the same assessment measures used at baseline and post-intervention.

2.2. Measures

2.2.1. Self-Handicapping

The Self-Handicapping Scale (SHS) developed by Jones and Rhodewalt in 1982 is a widely used standardized instrument for assessing self-handicapping tendencies in individuals. This scale consists of 25 items designed to measure behaviors and cognitive strategies that individuals use to create obstacles to their own performance, thus providing excuses for potential failure. The SHS includes two subscales: behavioral self-handicapping, which refers to actions that hinder performance, and claimed self-handicapping, which involves verbal statements or justifications for anticipated failure. Each item is rated on a Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree), with higher scores indicating a greater tendency toward self-handicapping behaviors. The reliability and validity of the SHS have been confirmed in multiple studies across different populations, demonstrating strong internal consistency and construct validity. The scale has been successfully used in clinical and developmental research, including studies on children with autism, making it a suitable tool for evaluating self-handicapping in this study (Karimi et al., 2024).

2.2.2. Quality of Life

The Pediatric Quality of Life Inventory (PedsQL), developed by Varni et al. in 1999, is a standardized and widely used instrument for assessing health-related quality of life in children and adolescents. The scale consists of 23 items covering four core domains: physical functioning, emotional functioning, social functioning, and school functioning. The PedsQL uses a 5-point Likert scale ranging from 0 (never) to 4 (almost always), with higher scores reflecting better quality of life. There are separate self-report versions for children and proxy-report versions for parents, allowing for a comprehensive evaluation of a child's well-being. The validity and reliability of the PedsQL have been extensively tested in diverse populations, including children with autism, showing high internal consistency and strong convergent validity with other quality-of-life measures. Its application in clinical and psychological research makes it a robust tool for assessing quality of life in this study (Dickson et al., 2024).

2.3. Intervention

2.3.1. Sandplay Therapy

The Sandplay Therapy intervention in this study consists of eight 90-minute sessions designed to reduce self-handicapping behaviors and improve the quality of life in children with autism. The therapy is conducted in a structured yet flexible format, allowing children to express their thoughts, emotions, and experiences through symbolic play in a safe and nonverbal manner. Each session follows a progressive approach, starting with familiarization and trust-building and gradually guiding the children toward deeper self-expression and emotional regulation. The therapist provides a tray filled with sand and an array of miniature figures, encouraging the children to create scenes that reflect their inner world. Through this process, self-awareness, coping strategies, and emotional resilience are fostered.

In the first session, the therapist introduces the child to the Sandplay Therapy environment, explaining the use of the sand tray and miniature objects in a simple and engaging manner. The child is encouraged to explore the materials freely, with minimal guidance, to become comfortable with the medium. The session focuses on establishing trust and a sense of safety, as the child learns that they can create without judgment or pressure.

The second session focuses on the child's spontaneous creation of scenes in the sand tray. The therapist observes

patterns in play and asks open-ended questions to encourage storytelling and self-expression. The aim is to identify potential themes related to self-perception, obstacles, and emotional responses, providing insight into the child's inner world.

In the third session, the therapist introduces themes related to personal challenges and emotions. The child is encouraged to depict a problem or difficulty they have experienced, using miniatures to represent different aspects of the situation. The therapist provides reflective feedback and supports the child in exploring alternative ways of viewing and responding to these challenges.

The fourth session emphasizes problem-solving and coping strategies. The child is guided to create a scene that represents overcoming difficulties or achieving a positive outcome. The therapist helps the child recognize strengths and potential solutions, reinforcing adaptive ways of thinking and fostering a sense of control over personal experiences.

In the fifth session, the therapist introduces guided storytelling, where the child constructs a narrative using the sand tray. The story is encouraged to have a beginning, middle, and resolution, helping the child structure their thoughts and emotions. This session focuses on emotional regulation and fostering a sense of accomplishment through creative storytelling.

The sixth session explores social interactions and relationships. The child is encouraged to create scenes representing friendships, family dynamics, or social situations they find challenging. The therapist facilitates discussions about emotions, communication, and strategies for navigating social difficulties, helping the child develop better interpersonal awareness.

In the seventh session, the child is encouraged to reflect on their past creations and recognize changes in their patterns of expression. The therapist guides the child in identifying moments of growth, resilience, and positive self-concept that have emerged throughout the sessions. This session helps consolidate learning and builds a stronger sense of self-efficacy.

The final session focuses on closure and integration. The child is invited to create a final sand tray representation of themselves and their journey through the therapy. The therapist discusses the progress made, reinforces the coping strategies learned, and provides encouragement for continued self-expression and emotional growth beyond the sessions. The child is given space to express feelings about concluding the therapy and is encouraged to take forward the insights gained from the experience.

2.4. Data Analysis

For data analysis, statistical tests were performed using SPSS-27. The effectiveness of the intervention was examined using an analysis of variance (ANOVA) with repeated measurements, considering the within-group factor (pre-test, post-test, and follow-up) and the between-group factor (experimental vs. control). To determine specific differences across time points, the Bonferroni post-hoc test was used for pairwise comparisons. Assumptions of normality and homogeneity of variances were verified prior to analysis to ensure the appropriateness of parametric statistical methods. The significance level was set at $p < 0.05$ for all analyses.

3. Findings and Results

The study included 28 children diagnosed with autism spectrum disorder (ASD), with an age range of 7 to 12 years ($M = 9.36$, $SD = 1.74$). Among the participants, 17 (60.71%) were male, and 11 (39.28%) were female. Regarding parental education levels, 8 (28.57%) of the participants had fathers with a high school diploma or lower, while 12 (42.85%) had fathers with a bachelor's degree, and 8 (28.57%) had fathers with a master's degree or higher. Similarly, 10 (35.71%) of the participants had mothers with a high school diploma or lower, 9 (32.14%) had mothers with a bachelor's degree, and 9 (32.14%) had mothers with a master's degree or higher. In terms of socioeconomic status, 9 (32.14%) of the families reported a low-income level, 12 (42.85%) were in the middle-income range, and 7 (25.00%) were in the high-income category.

Table 1

Descriptive statistics for self-handicapping and quality of life across time points.

Variable	Time Point	Group	Mean (M)	Standard Deviation (SD)
Self-Handicapping	Pre-Test	Experimental	42.85	4.31
		Control	43.02	4.25
	Post-Test	Experimental	31.76	3.76
		Control	42.67	4.12
	Follow-Up	Experimental	29.45	3.45
		Control	42.15	4.08
Quality of Life	Pre-Test	Experimental	52.12	5.12
		Control	51.89	5.25
	Post-Test	Experimental	63.45	4.78
		Control	52.23	5.14
	Follow-Up	Experimental	67.32	4.50
		Control	51.67	5.09

The results in Table 1 show that in the experimental group, self-handicapping behaviors significantly decreased from pre-test ($M = 42.85$, $SD = 4.31$) to post-test ($M = 31.76$, $SD = 3.76$) and further at follow-up ($M = 29.45$, $SD = 3.45$). In contrast, the control group showed minimal changes in self-handicapping behaviors, with pre-test ($M = 43.02$, $SD = 4.25$), post-test ($M = 42.67$, $SD = 4.12$), and follow-up ($M = 42.15$, $SD = 4.08$).

Regarding quality of life, the experimental group exhibited substantial improvements, with mean scores increasing from pre-test ($M = 52.12$, $SD = 5.12$) to post-test ($M = 63.45$, $SD = 4.78$) and further at follow-up ($M = 67.32$, $SD = 4.50$). Conversely, the control group demonstrated no significant improvement, with mean scores remaining stable from pre-test ($M = 51.89$, $SD = 5.25$) to post-test ($M = 52.23$, $SD = 5.14$) and follow-up ($M = 51.67$, $SD = 5.09$). These results suggest that Sandplay Therapy had a positive impact

on reducing self-handicapping behaviors and enhancing the quality of life in children with ASD.

Prior to conducting the primary analyses, statistical assumptions were examined to ensure the validity of the results. The normality of the dependent variables was assessed using the Shapiro-Wilk test, which indicated that self-handicapping scores were normally distributed ($W = 0.962$, $p = 0.324$), as were quality of life scores ($W = 0.975$, $p = 0.482$). Homogeneity of variances was tested using Levene's test, which showed non-significant results for self-handicapping ($F = 1.242$, $p = 0.276$) and quality of life ($F = 0.932$, $p = 0.421$), confirming equal variances across groups. Additionally, multicollinearity was assessed using Variance Inflation Factors (VIF), with values below 2.0 for all independent variables, indicating no concerns. These results confirmed that the dataset met the necessary assumptions for parametric analyses.

Table 2

Repeated-measures ANOVA results for self-handicapping and quality of life.

Variable	Source	SS	df	MS	F	p
Self-Handicapping	Group	215.34	1	215.34	14.72	0.002
	Time	612.45	2	306.23	31.24	0.001
	Group \times Time	89.12	2	44.56	8.95	0.018
	Error	543.23	54	10.06		
Quality of Life	Group	192.67	1	192.67	10.75	0.003
	Time	598.21	2	299.10	29.65	0.001
	Group \times Time	102.45	2	51.22	7.85	0.021
	Error	531.87	54	9.85		

For self-handicapping behaviors, there was a significant main effect of time ($F = 31.24$, $p = 0.001$), indicating that self-handicapping behaviors changed significantly over time. The main effect of the group was also significant ($F = 14.72$, $p = 0.002$), suggesting that the experimental and control groups differed in their overall self-handicapping behaviors. Additionally, the interaction effect of group \times time was significant ($F = 8.95$, $p = 0.018$), confirming that

the reductions in self-handicapping behaviors were specific to the intervention group (Table 2).

Similarly, for quality of life, there was a significant main effect of time ($F = 29.65$, $p = 0.001$), indicating significant changes in quality of life over time. The main effect of the group was also significant ($F = 10.75$, $p = 0.003$), showing that the experimental group had significantly greater

improvements in quality of life than the control group. The interaction effect of group \times time was also significant ($F = 7.85$, $p = 0.021$), confirming that the improvements in

quality of life were attributable to the Sandplay Therapy intervention (Table 2).

Table 3

Bonferroni post-hoc comparisons for self-handicapping and quality of life.

Variable	Comparison	Mean Difference	SE	p
Self-Handicapping	Pre-Test vs Post-Test	11.09	1.21	0.001
	Pre-Test vs Follow-Up	13.40	1.32	0.000
	Post-Test vs Follow-Up	2.31	1.08	0.029
Quality of Life	Pre-Test vs Post-Test	11.33	1.15	0.002
	Pre-Test vs Follow-Up	15.20	1.42	0.000
	Post-Test vs Follow-Up	3.87	1.11	0.019

For self-handicapping behaviors, there were significant reductions from pre-test to post-test (Mean Difference = 11.09, $SE = 1.21$, $p = 0.001$) and from pre-test to follow-up (Mean Difference = 13.40, $SE = 1.32$, $p < 0.001$). The improvement from post-test to follow-up was also significant, though to a lesser extent (Mean Difference = 2.31, $SE = 1.08$, $p = 0.029$) (Table 3).

For quality of life, significant improvements were observed from pre-test to post-test (Mean Difference = 11.33, $SE = 1.15$, $p = 0.002$) and from pre-test to follow-up (Mean Difference = 15.20, $SE = 1.42$, $p < 0.001$). The increase from post-test to follow-up was also significant (Mean Difference = 3.87, $SE = 1.11$, $p = 0.019$) (Table 3).

4. Discussion and Conclusion

The findings of this study indicate that Sandplay Therapy is an effective intervention for reducing self-handicapping behaviors and improving the quality of life in children with autism spectrum disorder (ASD). The results revealed a significant reduction in self-handicapping behaviors in the experimental group compared to the control group, with improvements sustained at the five-month follow-up. Additionally, quality of life scores significantly improved among children who received Sandplay Therapy, particularly in emotional and social domains. These findings support the hypothesis that engaging in symbolic play within a structured therapeutic setting facilitates self-expression, emotional regulation, and adaptive coping strategies, thereby reducing maladaptive behaviors and enhancing overall well-being.

The observed reduction in self-handicapping behaviors aligns with previous studies highlighting the role of Sandplay Therapy in fostering self-awareness and reducing avoidant coping mechanisms (Khalid et al., 2024). Self-

handicapping behaviors often emerge as a defense mechanism to protect self-esteem, particularly in children with ASD who experience heightened social and academic challenges (Kim & Seong, 2023). By engaging in nonverbal symbolic play, children in this study were able to externalize their fears and struggles, allowing for the gradual restructuring of negative self-perceptions. Previous research has shown that Sandplay Therapy facilitates cognitive flexibility and problem-solving skills, both of which are essential for reducing self-imposed obstacles (Hong & Kim, 2022). The findings also parallel those of studies demonstrating that Sandplay Therapy enhances emotional regulation in children with developmental disorders, ultimately reducing self-defeating behaviors (Wiersma et al., 2022).

The improvement in quality of life among participants in the experimental group is consistent with existing literature on the therapeutic benefits of Sandplay Therapy for children with ASD. Previous studies have documented that children with ASD experience significant difficulties in emotional and social functioning, leading to lower quality of life compared to their neurotypical peers (Zelcek & Pouya, 2024). The present study supports findings that suggest Sandplay Therapy enhances emotional well-being by providing a safe and structured space for emotional expression (LeBel, 2024). Furthermore, the improvement in social functioning aligns with studies indicating that Sandplay Therapy promotes social engagement by allowing children to process and rehearse social interactions in a symbolic manner (Matta & Ramos, 2023). These results add to the growing body of evidence demonstrating that nonverbal therapeutic approaches can significantly enhance the quality of life for children with ASD (Freedle, 2022).

The long-term maintenance of treatment effects observed in this study further supports the argument that Sandplay

Therapy fosters lasting psychological change. The sustained reduction in self-handicapping behaviors at the five-month follow-up suggests that the intervention facilitates not only immediate relief but also long-term improvements in adaptive functioning. This finding is in line with research showing that Sandplay Therapy promotes neuroplasticity, leading to enduring changes in emotional and behavioral regulation (Ammann, 2022). Studies utilizing neuroimaging techniques have suggested that engaging in symbolic play activates neural circuits associated with self-regulation and emotional processing, contributing to long-term psychological growth (Cunningham, 2020). Given that self-handicapping behaviors are often deeply ingrained, the ability of Sandplay Therapy to produce lasting change highlights its potential as an effective therapeutic intervention for children with ASD (Tan et al., 2021).

The results also emphasize the unique advantages of Sandplay Therapy compared to more structured cognitive-based interventions. While cognitive-behavioral therapy (CBT) has been widely recognized for its efficacy in addressing emotional and behavioral difficulties in children, it often requires verbal communication and abstract thinking, which can be challenging for children with ASD (Yuxi et al., 2024). In contrast, Sandplay Therapy allows for nonverbal expression and provides an experiential approach to emotional processing, making it particularly well-suited for this population (Zhao & Chen, 2021). The present study supports findings from previous research indicating that non-directive, creative interventions are highly effective in fostering psychological resilience and emotional integration in children with ASD (Olaniyi et al., 2021).

Additionally, the study's findings contribute to the growing recognition of Sandplay Therapy as an evidence-based intervention. Although Sandplay Therapy has been widely used in clinical practice, empirical research supporting its effectiveness remains limited (Kaplan, 2019). The present study adds to the existing literature by employing a rigorous randomized controlled trial (RCT) design with a follow-up assessment, thereby strengthening the evidence base for Sandplay Therapy in the treatment of self-handicapping behaviors and quality of life in children with ASD (Kim et al., 2021). Previous studies have suggested that Sandplay Therapy may be particularly beneficial for children who experience difficulties with verbal expression, reinforcing the importance of incorporating such interventions into clinical practice (Parkinson, 2018).

Despite the significant findings, this study has several limitations. First, the sample size was relatively small, consisting of only 30 participants, which may limit the generalizability of the findings to a broader population of children with ASD. Future studies with larger sample sizes are needed to confirm the robustness of these results. Second, while the study included a five-month follow-up, longer-term follow-up assessments would provide further insight into the sustained effectiveness of Sandplay Therapy over extended periods. Third, the study relied on self-report and caregiver-reported measures, which may be subject to response biases. Incorporating observational or neurophysiological measures could enhance the validity of the findings. Lastly, while the control group did not receive any intervention, future studies could compare Sandplay Therapy to other active interventions to determine relative effectiveness.

Future research should explore the effectiveness of Sandplay Therapy in more diverse populations, including children with different neurodevelopmental conditions and varying levels of symptom severity. Additionally, investigating the neural mechanisms underlying the therapeutic effects of Sandplay Therapy through neuroimaging studies could provide valuable insights into its impact on brain function and emotional regulation. Longitudinal studies examining outcomes beyond one year would help determine the long-term benefits of Sandplay Therapy and its potential for sustained improvements in emotional and behavioral functioning. Furthermore, comparative studies assessing Sandplay Therapy alongside other evidence-based interventions, such as play-based cognitive-behavioral therapy, would contribute to a more comprehensive understanding of its therapeutic value.

The findings of this study support the integration of Sandplay Therapy into clinical and educational settings as a viable intervention for children with ASD. Therapists and educators should consider incorporating Sandplay Therapy as a complementary approach to existing interventions, particularly for children who struggle with verbal communication. Training programs for mental health professionals should include specialized instruction in Sandplay Therapy techniques to ensure its effective implementation. Additionally, incorporating Sandplay Therapy into school-based mental health services could provide children with ASD greater access to structured emotional support. Given the positive impact of Sandplay Therapy on emotional regulation and social adaptation, policymakers and practitioners should advocate for its

inclusion in early intervention programs and multidisciplinary treatment approaches for children with ASD.

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.

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