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Reducing Loud Vocalization through Noncontingent Reinforcement and Differential Reinforcement of Incompatible Behavior in a Child with Autism Spectrum Disorder

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Abstract

The prevalence of Autism Spectrum Disorder (ASD) has increased in recent decades and development of treatment techniques for the disruptive behaviors associated with autism has become an essential requirement. This research investigates the role of Non-contingent Reinforcement (NCR) and Differential Reinforcement of Incompatible Behaviors (DRI) for loud vocalizations, particularly among children with ASD. A functional behavior assessment was done to determine the targets of the intervention; this intervention consisted of 14 sessions of reinforcement statements. Intervention was implemented by teachers, including statements to reinforce desirable behavior and reduce undesirable behavior. With the help of NCR and DRI strategies, treatment was designed for loud vocalizations at home, school and clinic. Assessments were also done once a week after a month's interval to check whether the changes were lasting. The outcome of the intervention showed that it was effective in the reduction of loud vocalizations. Subsequent follow up results showed that these changes were also maintained; showing the effectiveness of interventions as successful. It was further shown that children with ASD benefitted greatly from individualized treatment plans due to these positive outcomes, providing further understanding of behavioral difficulties of such populations.

Keywords: Autism Spectrum Disorder, Differential Reinforcement of Incompatible Behaviors, Noncontingent Reinforcement

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Introduction

The Center for Disease Control estimates that there has been a steady rise in the prevalence of Autism Spectrum Disorder (ASD) in the past few decades; which emphasizes the salience of understanding the topic (CDC Newsroom, 2023). As childhood prevalence of autism increases, so does the growing demand for finding ways of treating and managing the issues associated with this disorder. Autism Spectrum Disorder (ASD), as the name implies, is a spectrum of behaviors that have been categorized under the umbrella of autism. These behaviors can vary largely, however a majority of the children diagnosed with this disorder often exhibit some common behaviors, these include, loud vocalization and restlessness. Being prone to loud outburst can make social integration, educational learning and day to day functioning seriously challenging. As such this case study focuses on one of the more serious symptoms of ASD i.e., loud vocalization, by implementing behavioral intervention programs to help manage this behavior. For this purpose, Differential Reinforcement (DRI) and Non-Contingent Reinforcement (NCR) of Incompatible

Behaviors statements were employed in an experimental fashion to reduce loud outbursts among children with ASD.

Differential reinforcement has proven quite useful in previous studies; in treatment of a wide range of behavioral problems (Cooper et al., 2007; Weston et al., 2018). Differential reinforcement works by reinforcing desirable behaviors that are incompatible with undesirable behaviors (Watts et al., 2013). Children with ASD often express loud outburst to gain attention or to convey their point of view, these vocalizations may stem from high sensory sensitivities or difficulty communicating (Cleaveland, 2020). Teaching ASD children, a more practical method of conveying their message may help lessen their reliance of this behavior. Differential reinforcement treatment may prove useful in reducing the undesirable vocal outburst by redirecting the children's attention towards more productive strategies of communication (Mantzoros et al., 2023). This custom treatment can help encourage the child to discover more appropriate means of communication that at the same time is the antithesis of being loud.

In order for treatment to be effective, there needs to be identification of specific reinforces of the undesirable problematic behavior this analysis enables practitioners to create individually tailored extinction procedures. It is necessary to identify these enablers of the problematic behavior to devise strategies to remove those (Bouton et al., 2021). Since loud vocalizations are a symptom of a desire to communicate, understanding the underpinned function of these vocalizations can help practitioners create reinforcement for behaviors that can manage and modify the loud vocalization.

Studies show that DRI is a versatile means of modifying behaviors to achieve desired outcomes, studies show; it leads to improve task-oriented activities (Watts et al., 2013), be effective in modifying attention-seeking, sensory-related, and escape-maintained behaviors (Bishop et al., 2020; Sharma et al., 2021). However, addressing problematic behavior through careful selection of an incompatible behavior can be quite difficult, another approach to reducing loud vocalizations is though Non-Contingent Reinforcement (NCR). NCR reduces the undesirable behavior by removing incentive to exhibit said behavior, it does this by incorporating reinforcements in a fixed schedule, irrespective of the presence or occurrence of problematic behavior (Brooks, 2024). The theory behind this is that by providing reinforcements at predetermined periods of time i.e., a reinforcement schedule that remains unaffected by the behavior of the individual; creates an environment for the individual to learn that the problematic behavior serves no purpose as such should be stopped (Knowles-Cervantes, 2020).

NCR is particularly useful for addressing behaviors associated with autism, such as loud vocal outbursts, especially in inappropriate settings like classrooms (Myerberg, 2022). Moreover, NCR proves a useful means of addressing verbal and physical stereotypes (Badri, 2023; Rapp et al., 2017). With studies showing the effective use of NCR to manage escape-maintained behaviors; behaviors aimed at avoiding or delaying tasks i.e., loud vocalizations to distract from completing tasks (Andzik et al., 2022). By reducing these vocalizations, NCR can contribute to a more positive classroom environment, enhancing learning opportunities for all students (Brooks, 2024). This positive shift is critical, as a supportive learning environment significantly impacts the overall development of children with ASD.

Moreover, combining NCR with other behavioral interventions can yield even more substantial results. For instance, integrating NCR with Social Skills Training has been shown to improve social interactions among

children with ASD (Boyle et al., 2022). This comprehensive approach addresses both communication challenges and the underlying social deficits that children with ASD often face.

In summary, NCR has widespread applications in addressing the underlying causes of undesirable behaviors. Research shows that escape-maintained behaviors—those aimed at avoiding tasks—are most effectively treated with NCR (Newman et al., 2021). This makes NCR exceptionally suitable for classroom settings, where teachers can implement these strategies effectively. By employing Differential Reinforcement of Incompatible Behaviors and Non-Contingent Reinforcement, we can better manage unacceptable behaviors while reinforcing acceptable ones. This approach aligns with evidence-based practices for behavior modification in individuals with ASD (Knowles-Cervantes, 2020).

Objective

This case study's objective was to assess the effectiveness of Reinforcement interventions in minimizing loud vocalization behaviors and promoting more appropriate communication strategies in a child with Autism Spectrum Disorder. Reinforcements used were NCR and DRI.

Method

Study Design

The study was ABA, meaning it had a single subject design. It was designed to assess the effectiveness of Reinforcement interventions in a child with Autism Spectrum Disorder. A quasi-experimental design was used where treatment was provided in form of reinforcement and the resultant effects were studies. This study utilized an alternating treatments design with a probe across settings to assess for generalization. At least three sessions were conducted for taking baseline data. Baseline data was collected from three settings (Home, School and Clinical setting).

Participant

The research focused on a single male participant, aged 4 years and 8 months. The child had received a diagnosis of Autism Spectrum Disorder and had undergone Applied Behavior Analysis (ABA) instruction starting at 3 years 6 month of age. The selection criteria was based on the participant consistently displaying high percentages of loud vocalization, as outlined in Appendix A, including a functional analysis description and data. Specifically, these vocalizations occurred in over 30% of the 5-minute intervals during 30-minute functional-analysis session. The 30% threshold for intervention aligns with common criteria in contemporary research, as observed in studies by Ahearn et al. (2007).

The child showed tactile and listener repertoire, meaning that he expressed an expressive as well as receptive vocabulary consisting of 2000 words. The child was able to perform most of his daily activities without help or assistance and was able to follow directions up-to 2-step. His loud vocalization included: singing national anthem in a loud voice, asking for break loudly, singing poems.

Measures

Based on the frequency of behavior exhibited by the participant at baseline, a fixed-time schedule with a timer for every 30 seconds was developed. The FI-30 seconds schedule was to create an individualized intervention with reinforcements deployed at the desired intervals. The timer was not made visible to the participant so as not to distract him.

Setting and Materials

The 14 session interventions were carried out at the child's school and within the Hospital, a shadow teacher worked on generalization in school. Certain items were present: a table, a couple of chairs and some tangible reinforcements which included edible food stuff and materials for the intervention

Mastery Criteria

During therapy session client will independently request for attention.

Program Setup

The intervention program will take place in a structured and supportive environment, incorporating visual supports, and implementing a reinforcement system. Collaborative efforts with parents, caregivers, and educators are crucial for consistency across various settings. Proactive and reactive strategies will be used in both conditions.

Condition 1 will be individual session.

Condition 2 will be group setting with 4-5 peers present.

Procedure

The case study employed a four step procedure, starting with a pre-assessment, assessment and conducting an intervention and finally a follow up after the intervention.

Pre-Assessment

The researcher held discussions with the participant's parents, offering both written and verbal explanations regarding the child's participation in the study. They were clarified on their right to remove their child from the study at any point and assured that utmost care would be taken to ensure no harm came as a result of the treatment. Written informed consent was provided for the parents to sign along with a brief explanation on the objectives of the study.

Functional Behavior Assessment

This FBA was done before starting the intervention; using ABC data (Table 1) and QABF (Figure 2). Following the FBA assessment, baseline data was collected in 3 sessions. Based on assessment it was concluded that the NCR statements delivered by the teacher along with the praise of peers appropriate as the child showed signs of disruptive behavior, and these behaviors were directed at gaining adult and peer attention.

Antecedent Condition

Identification of antecedent conditions triggering loud vocalization is essential. Through careful observation and analysis, not getting attention in specific environmental or situational factors precede the target behavior.

Prompts

Utilizing prompts involves guiding the child toward desired behaviors using visual or auditory cues. The level of intrusiveness needed was determined and Direct verbal prompt was used initially gradually fading it for independent Manding.

Consequence

A structured consequence system is implemented to reinforce positive behaviors and discourage loud vocalization. This section details the specific consequences, including social praise, tangible rewards, or other reinforcement strategies, contributing to behavior modification.

Intervention

NCR and DRI statements were used for the intervention phase, Intervention was completed after a total of 14 sessions. The researcher developed and executed the program. Before the start of the intervention, the researcher provided a briefing to the mother and shadow teacher.

Post Intervention

The follow up phase was conducted for four times. First follow up was done after 1 week, second after 2 weeks of intervention, third phase after 3 weeks of intervention and the last phase after 1 month.

Results

The results of the intervention aimed at reducing loud vocalization in a child with Autism Spectrum Disorder (ASD) revealed promising outcomes. The functional behavior assessment identified disruptive behaviors associated with seeking attention, informing the selection of teacher-delivered Noncontingent Reinforcement (NCR) statements. Baseline data indicated consistent

loud vocalization in over 30% of intervals across home, school, and clinical settings.

Table 1
ABC DATA (N=1)

Date	Antecedent	Behavior	Consequence
7/12/23	Counting blocks	Shouting names of people	Asked to quiet and settled down
7/12/23	Beads activity	Singing old McDonald loudly while doing activity	Took activity away but kept singing while maintaining eye contact
8/12/23	Writing alphabets	Looks at therapist and started singing wheels on the buss loudly	Asked to be quiet and started singing more loudly
9/12/23	Sitting in group other child is giving introduction	Started saying names of all the children loudly	Everyone looked at him
9/12/23	Sitting in group , other child is doing activity. He is asked to wait. Everyone claps for his peer.	Started screaming and then singing national anthem	Peers started laughing
9/12/23	Doing activity independently	Started making names loudly of the intern Sitting into the room.	Interns Looks at him and told do the activity

Figure 1

Frequency Graph of Loud Vocalization

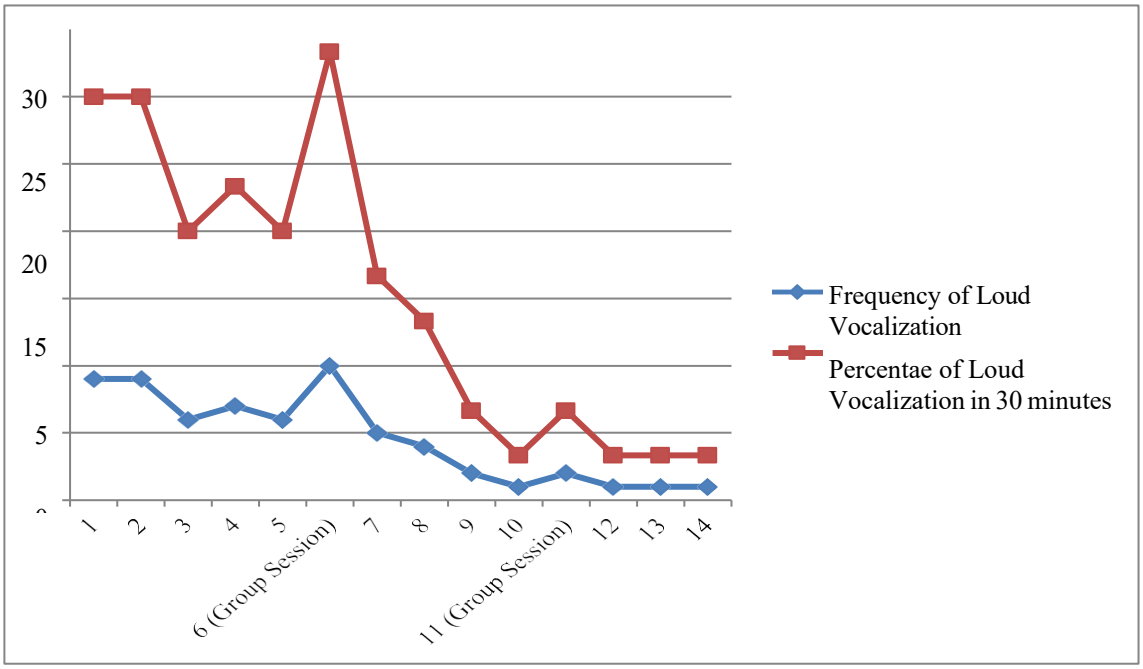
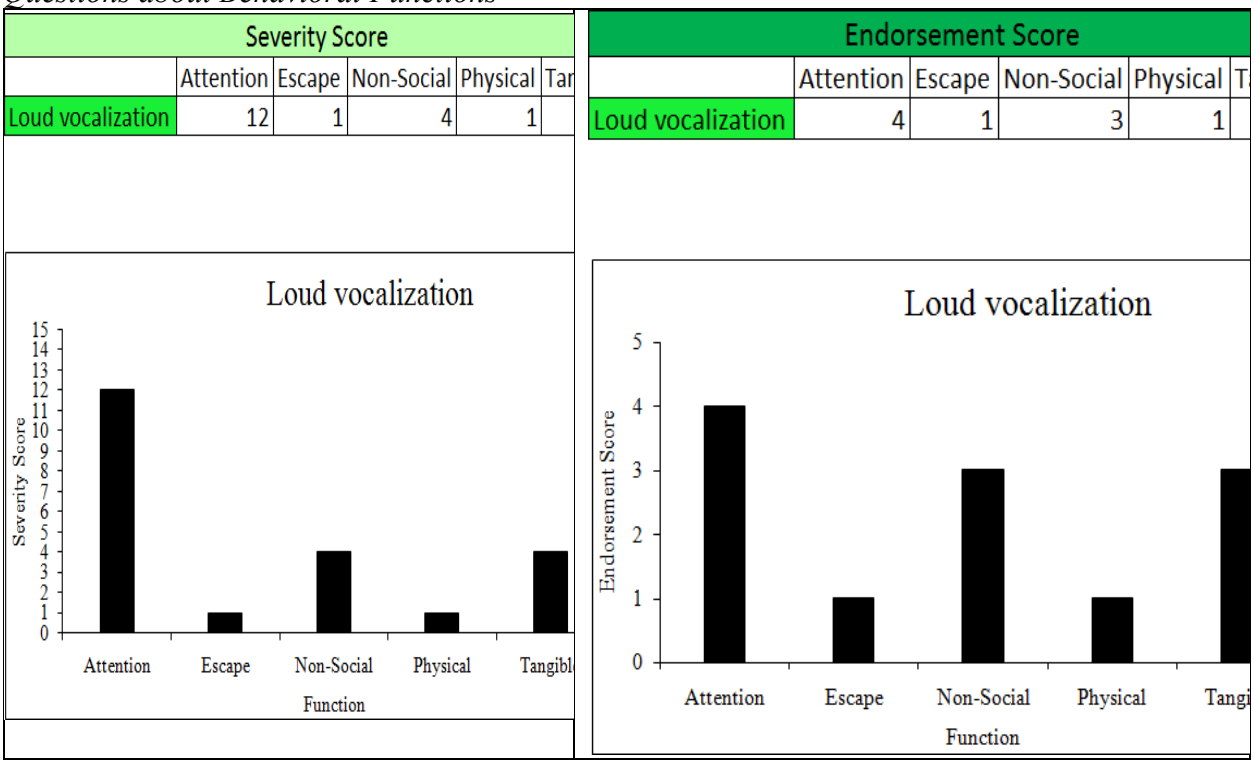


Figure 2

Questions about Behavioral Functions



Severity Score	Attention	Escape	Non-Social	Physical	Tar
Loud vocalization	12	1	4	1	

Endorsement Score	Attention	Escape	Non-Social	Physical	T
Loud vocalization	4	1	3	1	

During the 14-session intervention phase, which incorporated non-contingent reinforcement and Differential Reinforcement of Incompatible Behavior

(DRI) strategies, the participant successfully met the criteria, achieving 90% of vocalizations at or below 55 decibels in condition 1. Similarly, the criteria for 80% of vocalizations at or below 55 decibels were achieved for condition 2. Follow ups were conducted four times after each week for a month.

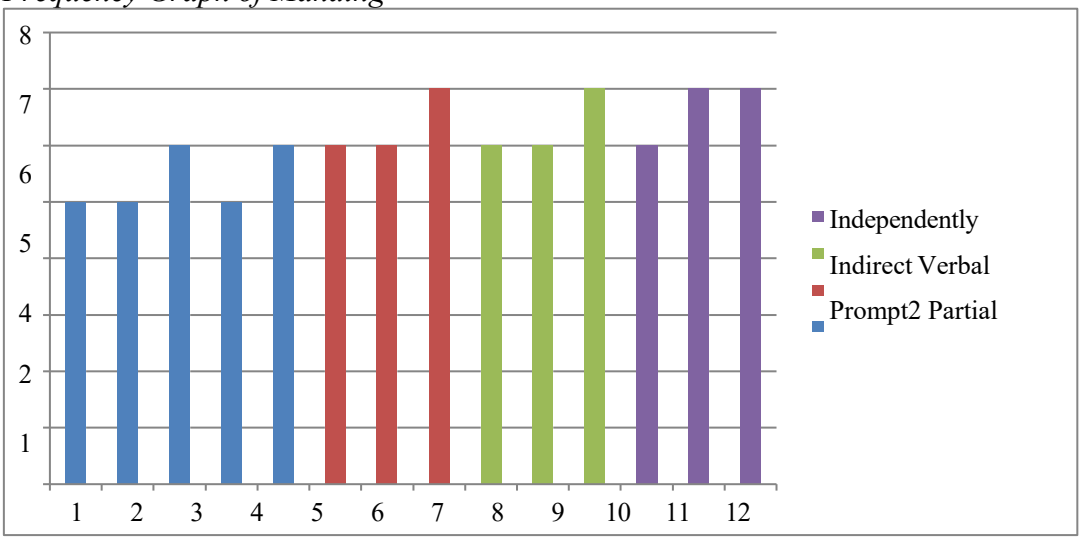
Follow up results consistently show that even after end of the intervention, there appeared to be consistent and sustained improvements, which means that the intervention can have lasting benefits and is effective in leading to consistent change. The results of this case study show that there is a high potential of NCR and DRI treatment in addressing the highly challenging behaviors among children with ASD. The results show individually tailored interventions have a higher success rate. The results demonstrate a significant reduction in loud vocalization among those treated, showing a noteworthy decrease in both individual and group sessions at 90% and 80% subsequently.

Manding for Attention

Manding progress of the participant was consistently progressing favorably across intervention sessions. At first, during manding activities, the learner could only mand under vocal prompts as seen in the score of 5 (the highest) and 6. Yet, over the course of the intervention, it became clear that there was a promising development in manding skills. The relative reduction in the participant's response to verbal prompts suggested less dependence on external cueing. More specifically, repeated verbal prompts faded to partial verbal prompts, indicating a higher level of independence in manding. The positive reinforcement trend continued as the participant began to follow through on partial verbal prompts, then independently manded. Finally, by the end of the intervention phase the participant was consistently able to mand independently per requests. This improvement shows that the intervention was effective in improving communication skills among the Autistic children, both Noncontingent Reinforcement (NCR) and Differential Reinforcement of Incompatible Behavior (DRI) show clear results in helping increase communication skills among the child with Autism Spectrum Disorder.

Figure 3

Frequency Graph of Manding



Discussion

The findings of this study provide critical insights into the management of loud vocalizations in children with Autism Spectrum Disorder (ASD). Given the increasing prevalence of ASD, the implications of effectively addressing behaviors such as loud vocalization cannot be overstated. This study utilized a combination of Noncontingent Reinforcement (NCR) and Differential Reinforcement of Incompatible Behaviors (DRI) to create a structured intervention that not only reduced disruptive vocalizations but also promoted more appropriate communication strategies. The successful outcomes underscore the necessity for individualized approaches to treatment, which can significantly enhance the quality of life for children with ASD and support their social integration and educational engagement.

Throughout the 14-session intervention phase, the combination of NCR and DRI yielded impressive results. The participant demonstrated a 90% reduction in loud vocalizations in individual settings and an 80% reduction in group settings, highlighting the efficacy of these tailored interventions. This aligns with previous research indicating that differential reinforcement strategies, including NCR and DRI, can effectively redirect undesirable behaviors while fostering appropriate communication methods (Mantzoros et al., 2023; Weston et al., 2018). The substantial decrease in vocalizations emphasizes the importance of personalized strategies that cater to the unique needs of each child. Follow-up assessments conducted at regular weekly intervals showed that these improvements were not only significant but also sustained over time, suggesting that the interventions fostered lasting behavioral change.

Moreover, the findings align with existing literature that supports the effectiveness of NCR and DRI in managing various challenging behaviors in children with ASD. Prior research has demonstrated that these strategies can help redirect undesirable behaviors and bring attention toward more appropriate communication methods (Bishop et al., 2020; Knowles-Cervantes, 2020). This study contributes to the growing body of evidence that individualized treatment strategies can effectively reduce undesirable behaviors among children with ASD, not only as short-term interventions but also as long-term solutions for behavioral management.

However, it is essential to acknowledge certain limitations inherent in this study. The single-case design restricts the generalizability of the findings, indicating a need for future research that includes a larger and more diverse sample. Such studies would enhance the validity of the results and provide a broader understanding of the interventions' effectiveness across different populations (Badri, 2023; Sharma et al., 2021). Additionally, the reliance on teachers to consistently deliver NCR may introduce variability in intervention effectiveness. Individual teaching styles, situational differences, and external factors can impact the delivery and consistency of the interventions, which are critical for achieving long-term effects.

Furthermore, while this study specifically focused on loud vocalizations, it is vital to consider a more holistic approach that addresses other behaviors commonly associated with ASD. A comprehensive understanding of a child's overall progress and well-being requires consideration of various behavioral dimensions (Brooks, 2024). Future studies should explore the interplay between loud vocalizations and other behaviors, such as social withdrawal or repetitive actions, to gain a more nuanced view of the child's development.

Despite these limitations, the results of this study provide valuable insights into effective

interventions for managing behaviors associated with ASD. The positive outcomes of implementing NCR and DRI underscore the importance of evidence-based practices in fostering better communication and social integration for affected children. As the prevalence of ASD continues to rise, the urgency for effective, individualized treatment strategies becomes even more pronounced (Andzik et al., 2022; Myerberg, 2022). By further exploring and refining these approaches, we can contribute to improving the quality of life for children with ASD and their families.

Conclusion

This research examines the effectiveness of Non-contingent Reinforcement (NCR) and Differential Reinforcement of Incompatible Behaviors (DRI) in reducing loud vocalizations among children with Autism Spectrum Disorder (ASD). A 14-session intervention, implemented by teachers, targeted undesirable behaviors using reinforcement strategies in home, school, and clinical settings. The intervention led to a significant reduction in loud vocalizations (90% in individual and 80% in group settings) and maintained these improvements over time. The findings highlight the success of individualized treatment plans in addressing behavioral challenges in children with ASD. Which seems an appropriate strategy to treat the problem.

Contribution of Authors

Mishal Shabbir: Conceptualization, Investigation, Methodology, Data Curation, Writing – Original Draft

Muhammad Ismail Masood: Methodology, Writing - Reviewing & Editing

Zafar Ahmad: Methodology, Formal Analysis, Writing - Reviewing & Editing

Conflict of Interest

There is no conflict of interest declared by the authors.

Source of Funding

The authors declared no source of funding.

Data Availability Statement

The datasets of the current study are not available publicly due to ethical reasons but are available from the corresponding author [Z.A.] upon the reasonable request.

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