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Functional Behavior Assessment-Based Intervention for Repetitive Motor Behaviors of a Child with Autism in an Inclusive Classroom: A Single-Case Study

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Abstract: One of the core challenges faced by children with autism is repetitive motor behavior, which not only undermines their learning efficiency in the classroom but also makes it difficult for them to integrate smoothly into inclusive educational settings, thereby hindering their social adaptation and overall development. This study adopted a single-case design focusing on a first-grade student with autism enrolled in a mainstream class at Xiangxue Primary School, Huangpu District, Guangzhou. Functional behavior assessment was conducted to systematically observe and analyze the student's repetitive motor behaviors in class, on the basis of which an intervention plan was developed and implemented. The intervention incorporated antecedent control, replacement behavior training, and consequence management, supplemented by collaboration between school and family. The findings indicated that the frequency of repetitive motor behaviors decreased significantly after the intervention, while the student demonstrated improved classroom participation and peer interaction; these positive effects were maintained during the follow-up phase. The study suggests that in inclusive education settings, interventions guided by functional behavior assessment can effectively reduce problem behaviors in children with autism and enhance their classroom engagement and learning adaptability.

Keywords: Inclusive classroom; Children with autism; Repetitive motor behavior; Functional behavior assessment; Behavioral intervention

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1. Introduction

Autism is a type of pervasive developmental disorder, primarily characterized by speech communication difficulties, social interaction deficits, repetitive behaviors, and a narrow range of interests and activities [1,2]. Recent studies indicate that the prevalence of autism may be as high as one percent [3]. Given the large population base

in the country, it is common to find one or more children with varying degrees of autism in general education classrooms [4]. The challenge of helping these children better integrate into classrooms and achieve development has become a pressing issue for both general education and resource teachers [4].

Repetitive behaviors are a form of self-stimulatory behavior in children with autism, mainly referring to fixated patterns in certain body movements, postures, and activities [1]. If these behaviors are abruptly interrupted, they may lead to emotional outbursts, self-injury, and aggression. This significantly affects the classroom environment and is detrimental to inclusive education. Moreover, there are vast individual differences among children with autism, including their temperament types, which, combined with the dynamic nature of the inclusive environment, further intensify the awkward position of these children in inclusive education [5]. In light of this situation, this study selects a case of an autistic child in the first grade, Xiao Wei (a pseudonym), to intervene in his repetitive behaviors during daily classroom activities, aiming to help him coexist within the inclusive environment [6].

2. Research methods

2.1. Research subject

The research subject is Xiao Wei (a pseudonym), a 7-year-old autistic student who is enrolled in the first grade at our school. He was diagnosed with moderate to mild autism at the age of 4. After the diagnosis, he began receiving cognitive, sensory integration, language, and social skills intervention alongside attending kindergarten. His rehabilitation training is still ongoing. He entered our school's first grade at the age of 6. His current abilities are as follows:

Xiao Wei's cognitive abilities are slightly below average in the class, while his language comprehension is relatively good, although his expressive language skills are somewhat weaker. However, he can still communicate effectively enough for classmates and teachers to understand his meaning. His self-care abilities are fairly good; he can independently dress and undress, take care of his lunch, and manage his bathroom needs. His gross motor skills are relatively coordinated, and his fine motor skills are also well developed, enabling him to complete general writing tasks. However, he finds it difficult to fall asleep during nap time. Xiao Wei enjoys activities like running, listening to music, watching rain, making funny faces, moving a ruler in front of his eyes, and shifting his body while sitting or standing. Occasionally, he uses the ruler to lift the hair of female classmates. He is less proactive in expressing himself to peers and teachers. When it comes to food, he is quite picky, eating mostly vegetables but rarely any meat, and he enjoys crunchy, sweet, and savory foods.

Through interviews with the class teacher and research observations, it was found that Xiao Wei often disrupts both his own and his classmates' academic performance by moving a ruler back and forth in front of his eyes during class. Therefore, the target behavior was defined as: Xiao Wei moving a ruler back and forth in front of his eyes during class. Each occurrence of this complete action, where Xiao Wei takes out the ruler and moves it back and forth in front of his eyes, is counted as one instance of the target behavior and is recorded.

2.2. Research design

This study adopts a single-case research method, focusing on Xiao Wei's behavior as the subject of the research. By analyzing the behavioral changes of the case during the baseline and intervention phases, the effectiveness of the intervention is assessed. This flexible approach allows for a more intuitive observation of behavioral changes, enabling timely adjustments to the treatment methods and strategies to achieve the best results. It also better aligns with the significant individual differences in the physical and mental traits of children with autism.

The entire study is divided into three distinct treatment phases: the baseline phase, the intervention phase, and the follow-up phase [7]. The baseline phase consists of five days of observation and recording. Two fixed observation periods are conducted daily, using both observational methods and observation records, along with simple questionnaires and interviews to gather basic information about the subject's target behavior. The observational method is the ABC recording form and ABC analysis form developed by Zan Fei (2012), which records the antecedent events or situational events, behaviors, and behavioral outcomes of Xiao Wei's repetitive behaviors. The relationships between these elements are used to assess the function of the problem behavior. The interview questionnaire utilizes the Behavioral Motivation Assessment Scale (MAS) developed by Niu Wenying. The scale analyzes the individual's behavior from four functional aspects (sensory stimulation, task avoidance, seeking attention, and obtaining tangible items). These functions are assessed through 16 questions, with responses and behaviors being classified into five levels of severity, based on the analysis by close contacts such as the class teacher and observer. The behavior's function is determined from the score and analysis.

The intervention phase lasts for 20 days and focuses on addressing Xiao Wei's repetitive behaviors. Intervention strategies are based on functional behavior analysis and involve three key components: antecedent control, behavior training, and consequence management.

The follow-up phase lasts for five days and aims to confirm whether the positive behaviors achieved during the intervention phase can be consistently maintained in the natural classroom setting.

3. Intervention process

Based on the process design of positive behavior support, the overall intervention is divided into three phases: the baseline phase, the intervention phase, and the follow-up phase.

3.1. Baseline phase

During the baseline phase, the intervention plan was developed based on the overall design. The researchers used the aforementioned "ABC Observation Record Form" and "Behavioral Motivation Assessment Scale" to observe the case for one week, with two observation sessions each day, and collected data. In addition, interviews were conducted with Xiao Wei's class teacher and mother to determine the repetitive behaviors and their functional motivations. Based on the analysis of the case data, it was found that Xiao Wei's repetitive behavior involved moving a ruler back and forth in front of his eyes. As presented in **Table 1**. According to the test scores on the Behavioral Motivation Assessment Scale, the functional motivations for his behavior were found to gradually decrease from self-stimulation, seeking attention, task avoidance, to obtaining tangible items.

Table 1. Record form for assessing the motivation behind Xiao Wei's repetitive motor behavior

Functional categories	Total score	Average score	Ranking
Sensory stimulation	20	5	1
Task avoidance	8	2	3
Attention-seeking	13	3.25	2
Tangible rewards	7	1.75	4

3.2. Intervention phase

Considering that children with autism often exhibit multiple co-occurring disabilities, a comprehensive

intervention model is generally more effective than a singular intervention model [8]. The researchers implemented a multi-level, integrated intervention approach for Xiao Wei. The intervention phase lasted for 20 days and was carried out in three parts: antecedent control, behavior training, and consequence management. To ensure the effectiveness of the intervention, the researchers communicated with the parents and reached a verbal agreement to ensure consistency in the home-school intervention requirements.

Xiao Wei's main problem behavior is moving a ruler back and forth in front of his eyes. The intervention process for this behavior is as follows:

3.2.1. Antecedent control

Based on the analysis of the ABC Observation Record Form [9], the antecedent events for Xiao Wei's repetitive behavior are the need for proprioceptive and visual stimulation, as well as the desire for attention from others. This behavior often occurs after a period of time during class when both the teacher and classmates generally ignore him. Since his pencil case contains pens and rulers, he naturally begins to manipulate the ruler after some time in class. Given this situation, the researchers provided a solution: ten minutes before each class, Xiao Wei's proprioceptive needs were met through physical games. Additionally, in collaboration with the class teacher, the researchers made sure that every ten minutes during class, the teacher would pass by Xiao Wei's seat and offer him some attention.

3.2.2. Behavior training

Based on the functional analysis of Xiao Wei's repetitive behavior, the intervention focused on addressing his need for attention. The first step was to adjust his environment. The class teacher rearranged Xiao Wei's seat from one next to the wall and window to one by the aisle, which allowed the teacher to naturally offer attention to Xiao Wei every ten minutes.

The second step involved shaping alternative behaviors: It was found that Xiao Wei did not understand other uses for the ruler, especially in language and math classes, where the ruler is needed. The researchers used individual training sessions to shape and teach Xiao Wei to use the ruler correctly in these subjects, such as drawing lines or connecting dots in assignments. This way, the ruler could be used appropriately for academic tasks.

Given the speech and social communication difficulties common in children with autism, the researchers also created and taught Xiao Wei to use visual prompt cards during individual rehabilitation sessions to express his need for attention. Visual prompt cards were provided to Xiao Wei and his desk mate to encourage attention and highlight when Xiao Wei needed focus.

Finally, the researchers deconstructed the class content and teaching objectives in advance, providing pre-learning training to help Xiao Wei grasp the material beforehand. This strategy aimed to reduce problem behaviors caused by learning difficulties during class.

3.2.3. Consequence management

After Xiao Wei engages in his repetitive behavior, the researchers provide differential reinforcement through follow-up visits and photos. Additionally, a token system is established to delay Xiao Wei's gratification. Initially, Xiao Wei is given 10 tokens, and tokens are recorded when he does not engage in repetitive behavior within a certain number of occurrences. If the behavior occurs, tokens are deducted. At the end of the period, the remaining tokens can be exchanged for stationery items that Xiao Wei needs. Furthermore, Xiao Wei is also

given praise in the form of a congratulatory letter once a week at school and once a day at home.

3.3. Follow-up phase

After the intervention phase, a 5-day follow-up phase was conducted to observe and record Xiao Wei's repetitive behaviors. During the follow-up phase, individual training sessions were carried out as usual, with the main focus on deconstructing classroom learning content and objectives. In terms of antecedent control, the intervention gradually desensitized Xiao Wei by withdrawing the researchers' involvement. His proprioceptive needs were designed to be part of a routine activity, where he would go to the rehabilitation room before each class to self-satisfy his proprioceptive needs before returning to class. In terms of consequence management, it gradually transitioned to a self-summarized diary and family token exchange system.

The follow-up results indicated that Xiao Wei's problem behaviors did not show significant regression, and his behavior remained relatively stable compared to the intervention phase.

4. Research results and suggestions

During the intervention, a total of 40 behavior data points were collected. The baseline phase lasted for five days, with two observation sessions each day, yielding 10 sets of data. The intervention phase lasted for 20 days, with one intervention session per day, totaling 20 sets of data. The follow-up phase lasted for five days, with two observation sessions per day, collecting 10 sets of data.

From the data, the average number of occurrences of the problem behavior during the baseline phase was 6.9 times, during the intervention phase it decreased to 2.15 times, and during the follow-up phase it further decreased to an average of 2 times. The frequency of the problem behavior significantly decreased, demonstrating a positive intervention effect, which was maintained relatively stable during the follow-up phase. The analysis results are shown in **Figure 1**, illustrating the condition of repetitive motor behavior occurrence for the participant, Xiao Wei, during the baseline, intervention, and follow-up phases.

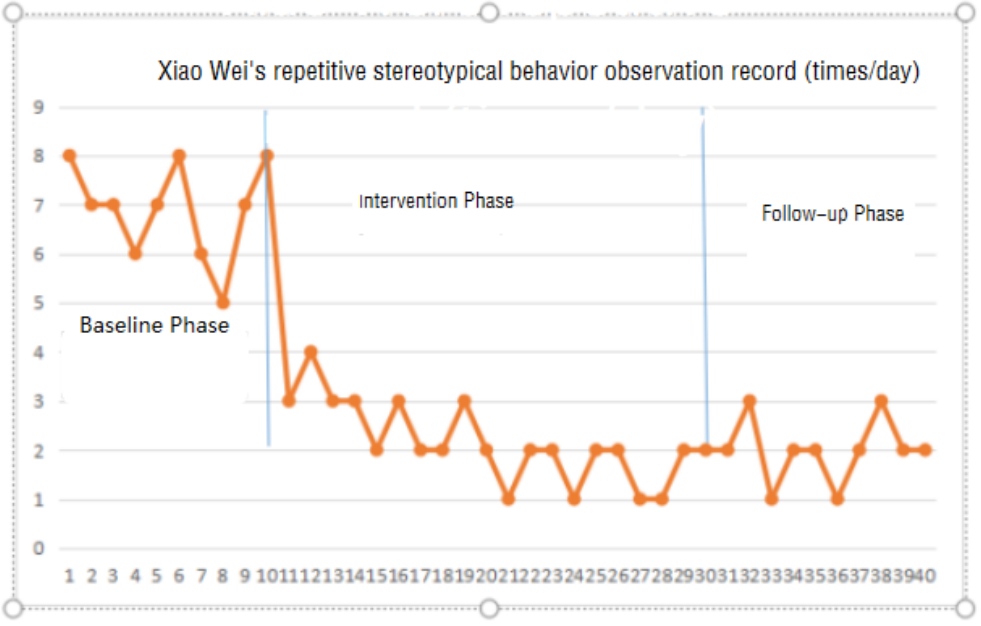

Figure 1. Repetitive motor behavior observation data for Xiao Wei (times/day)

The figure above shows the occurrence of Xiao Wei's repetitive behaviors during the baseline phase, intervention phase, and follow-up phase.

As seen in the figure, after the implementation of behavioral intervention, the frequency of Xiao Wei's repetitive behaviors decreased significantly compared with the baseline phase. Although there was a slight rebound at the beginning of the follow-up phase compared with the intervention phase, the increase was minimal. Overall, the intervention strategies proved to be effective.

From analyzing and reviewing the data collection process, the following suggestions can be drawn regarding the participation of children with autism in inclusive classrooms:

4.1. Children with autism are still children, they are not "different" and deserve respect

Although the case child, Xiao Wei, displayed behavioral problems such as repetitive actions, to ordinary teachers without prior exposure to special children or knowledge of special education, he might appear as an "outlier." However, from a humanistic perspective, Xiao Wei is first and foremost a child and should be regarded as such [9]. Children are in a period of physical and psychological development, possessing great potential and high malleability [10].

During the process of analyzing and addressing Xiao Wei's problem behaviors, in-depth conversations were conducted with his homeroom teacher. It became clear that most teachers lack understanding of such children and do not know how to respond appropriately. Influenced by limited awareness and various preconceived notions, some even perceived them as "different." Yet, when they witnessed the child's actual improvements, they often found it "miraculous." This reflects the fact that the needs of children with autism are often unmet and that they are not always treated with the respect they deserve.

4.2. The functions of problem behaviors in children with autism are often more than one

Before conducting a functional behavior analysis, it is difficult to fully determine the true motivations underlying problem behaviors in children with autism [11]. In the case of Xiao Wei, there were also discrepancies in identifying his motivations before and after the analysis. For example, task avoidance is often assumed to be the function of a student's problem behavior, but only through careful analysis can deeper motivations be uncovered.

The functional analysis results showed that two motivation scores were relatively close, which means that intervention strategies and training plans need to be developed with a comprehensive perspective [11,12]. In Xiao Wei's case, there were indeed two functional motivations. Without careful analysis, if the intervention had been designed based on only one assumed motivation, the effectiveness of the intervention would have been uncertain.

4.3. Addressing problem behaviors requires first establishing a positive relationship

In Xiao Wei's intervention process, the initial observations conducted without establishing a relationship actually led to the side effect of distraction. Establishing a supportive and collaborative relationship prior to formal intervention is particularly important [12], as it serves as a facilitator or "lubricant" in the process.

Observation and intervention in inclusive classrooms need to be carried out step by step [13]. In this study, there was some hesitation regarding whether Xiao Wei's problem behaviors should be observed directly in the classroom or in a more suitable environment. In inclusive classroom settings, direct observation by teachers clearly risks disturbing the class [14]. For Xiao Wei, during the observation phase of the intervention, he was

evidently aware that he was being watched and often shifted his gaze and attention toward the observer. As a result, it became necessary to first withdraw him for individual sessions to build rapport before returning to the classroom for more naturalistic observation.

4.4. Inclusive education requires diverse pathways

The management of behaviors needs to be supported by behaviorism, while the learning content requires construction through constructivism. In inclusive education classrooms, teaching objectives must be deconstructed and reconstructed to achieve true integration [15].

In the process of addressing Xiao Wei's problem behaviors, targeted designs and training were necessary. Simply reducing problem behaviors was not sufficient to meet Xiao Wei's need for self-stimulation. Therefore, the intervention also required establishing and shaping new behaviors to appropriately fulfill his needs for self-stimulation.

Inclusive education requires true integration, and integration built on the foundation of learning is the most reasonable form of inclusion. Therefore, while helping children with autism to participate in inclusive settings, support for learning should not be overlooked.

During the intervention phase, the process of deconstructing and reconstructing Xiao Wei's learning content and objectives went through a difficult period. The homeroom teacher and subject teachers often expressed disapproval or showed little cooperation with the deconstruction and reconstruction of learning activities. On one hand, this was due to the limited time and energy they had; on the other hand, it was related to a lack of professional expertise. As a result, the splitting and restructuring of learning content, as well as the redesign of differentiated learning objectives, required significant effort and support.

4.5. Viewing and addressing the problem behaviors of children with autism through positive and proactive strategies

When dealing with the problem behaviors of children with autism, positive and proactive support strategies are generally adopted. Positivity is not only a professional technique but also an educational perspective and philosophy. Shifting from simply managing consequences to proactively preventing and controlling antecedents, as well as making changes to the environment, can significantly reduce the frustration and distress experienced by both children with autism and their teachers.

4.6. Establishing and safeguarding systematic support models for inclusive education

Inclusive education in regular schools is not solely the responsibility of resource teachers; the establishment of an inclusive education team is urgently needed. In inclusive classrooms, addressing the problem behaviors of children with autism is impossible without team collaboration. For example, some classroom teachers may simply want to transfer these children to special education classes, believing that such classes are specifically meant to accommodate "problematic" children. Once sent away, they may even hope the child does not return to the regular classroom. This attitude is entirely unreasonable.

Only when systematic support is established—from administrative backing, to homeroom teachers, classroom teachers, and key peers—can a collaborative and interdependent support model be built. Alongside this, the formation of a unified team consciousness among resource teachers, homeroom teachers, and parents is essential. Such a team approach is necessary to better help children with autism participate meaningfully in inclusive education.

5. Conclusion

This single-case study demonstrated that a functional behavior assessment-based behavioral intervention package was effective in addressing the repetitive motor behaviors of a first-grade student with autism in an inclusive classroom. The integration of antecedent control, replacement behavior training, and consequence management, supported by school-family collaboration, led to a significant reduction in the target behavior. More importantly, the intervention yielded meaningful educational and social outcomes, as evidenced by the student's improved classroom participation and peer interaction. The maintenance of these gains during the follow-up phase further underscores the intervention's potential for fostering lasting positive change.

The findings offer several important implications for practice. Firstly, they reinforce the critical value of functional behavior assessment as a foundational step in designing effective, individualized interventions for children with autism. By moving beyond a mere reaction to behavior and instead understanding its function, educators can develop more targeted and humane strategies. Secondly, the success of this multi-component approach highlights that behavior reduction should not be the sole objective; equipping students with alternative, functionally equivalent skills is paramount for their long-term adaptation. Finally, the active collaboration between school and family was a crucial element, ensuring consistency and generalizing intervention effects across different environments.

Despite the positive outcomes, this study has limitations. The single-case design, while allowing for deep individual analysis, limits the generalizability of the findings to a broader population. Future research should involve more participants and employ group experimental designs to further validate the efficacy of functional behavior assessment-based interventions in inclusive settings. Additionally, exploring the specific contribution of each intervention component (e.g., antecedent strategies versus replacement training) and investigating strategies to better support the students' academic learning alongside behavioral improvement would be valuable directions for further inquiry.

In summary, this study provides compelling evidence that structured, function-based interventions are a powerful means to support children with autism in inclusive classrooms. By reducing barriers posed by repetitive behaviors, we can pave the way for their enhanced learning engagement and successful social integration.

Disclosure statement

The author declares no conflict of interest.

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