

Effects of Response Interruption and Redirection on Motor Stereotypies in Autism

Efeitos da Interrupção e Redirecionamento de Resposta em Estereotipias Motoras no Autismo

Efectos de la Interrupción y Redirección de Respuesta En Estereotipias Motoras en el Autismo

RESUMO

Objetivo: O artigo tem o objetivo de avaliar os efeitos do procedimento de Interrupção e Redirecionamento de Resposta sobre estereotipias motoras em crianças com Transtorno do Espectro Autista. **Método:** O método aplicado em duas crianças submetidas a avaliações comportamentais e análise funcional. Utilizou-se delineamento de tratamentos alternados comparando o procedimento com e sem atenção social durante vinte minutos. **Resultado:** O resultado demonstrou a análise funcional confirmou que as estereotipias eram mantidas por reforçamento automático. A intervenção promoveu redução acentuada no engajamento das estereotipias motoras em ambas as condições, mantendo a tendência de diminuição ao longo do tempo. **Conclusão:** A conclusão demonstrou o procedimento é eficaz no manejo e redução de estereotipias motoras interferentes, independentemente do fornecimento de atenção social adicional, reforçando sua aplicabilidade clínica analítico-comportamental.

DESCRIPTORES: Transtorno do espectro autista; Estereotipia motora; Interrupção de resposta; Redirecionamento de resposta; Análise do comportamento aplicada.

ABSTRACT

Objective: The article aims to evaluate the effects of the Response Interruption and Redirection procedure on motor stereotypies in children with Autism Spectrum Disorder. **Method:** The method was applied to two children submitted to behavioral assessments and functional analysis. An alternating treatments design was used to compare the procedure with and without social attention for twenty minutes. **Results:** The result demonstrated that the functional analysis confirmed that stereotypies were maintained by automatic reinforcement. The intervention promoted a sharp reduction in engagement in motor stereotypies in both conditions, maintaining a downward trend over time. **Conclusion:** The conclusion demonstrated that the procedure is effective in the management and reduction of interfering motor stereotypies, regardless of the provision of additional social attention, reinforcing its clinical behavior-analytic applicability.

DESCRIPTORS: Autism spectrum disorder; Motor stereotypy; Response interruption; Response redirection; Applied behavior analysis.

RESUMEN

Objetivo: El artículo tiene como objetivo evaluar los efectos del procedimiento de Interrupción y Redirección de Respuesta sobre las estereotipias motoras en niños con Trastorno del Espectro Autista. **Método:** El método se aplicó en dos niños sometidos a evaluaciones conductuales y análisis funcional. Se utilizó un diseño de tratamientos alternados comparando el procedimiento con y sin atención social durante veinte minutos. **Resultados:** El resultado demostró que el análisis funcional confirmó que las estereotipias se mantenían por reforzamiento automático. La intervención promovió una marcada reducción en la participación en las estereotipias motoras en ambas condiciones, manteniendo la tendencia a la disminución a lo largo del tiempo. **Conclusión:** La conclusión demostró que el procedimiento es eficaz en el manejo y reducción de estereotipias motoras interferentes, independientemente de la provisión de atención social adicional, reforzando su aplicabilidad clínica analítico-conductual.

DESCRIPTORES: Trastorno del espectro autista; Estereotipia motora; Interrupción de respuesta; Redirección de respuesta; Análisis de la conducta aplicada.

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Jaime Marques Ferreira Junior

Professor in the State Education Network of Mato Grosso, Professor in the Municipal Education Network of Juscimeira/MT, Master's Degree in Science and Mathematics Education/UNEMAT.

ORCID: <https://orcid.org/0009-0001-2900-0317>

Corresponding Author:

Email: jaimer@unemat.br

Address: Av. Joaquim Miguel dos Santos, 210 — Bairro Cajus, Juscimeira - MT, 78810-000

INTRODUCTION

The diagnostic characterization of Autism Spectrum Disorder (ASD) has undergone updates in international nosological manuals. According to the edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR)⁽¹⁾ and the International Classification of Diseases (ICD-11)⁽²⁾, autism is defined primarily by two core domains: (A) deficits in communication and social interaction across multiple contexts; and (B) restricted and repetitive patterns of behavior, interests, or activities. The term “spectrum” reflects the marked interindividual variability in clinical presentation, encompassing different degrees of impairment, excesses, and deficits in the individual's behavioral repertoire⁽³⁾.

The transition from ICD-10 to ICD-11 brought changes in the coding and categorical organization of neurodevelopmental disorders^(4,5). Under code 6A02, ICD-11 unified previous subdivisions—such as childhood autism, Asperger syndrome, and childhood disintegrative disorder—recognizing the heterogeneity and continuity of the spectrum^(2,5).

Within the diagnostic criteria of Criterion B, the presence of repetitive and stereotyped behaviors is a recurring clinical feature. Stereotypies, commonly referred to by the English term “*stims*” or “*stimming*,” consist of repetitive, rhythmic motor or vocal patterns with no apparent immediate social purpose^(6,7). Etymologically derived from the Greek *stereós* (solid) and *typos* (model), the term refers

to a rigid pattern of response. From⁽²⁾, these motor manifestations vary topographically from simple actions (such as rocking the body, *flapping* the hands, or wiggling the fingers) to complex and self-injurious actions (banging the head, biting oneself)^(8,9). Topographically, vocal stereotypies encompass repetitive phonetic productions, echolalia (immediate or delayed), and palilalia⁽¹⁰⁻¹²⁾.

From a neurodiversity perspective, authors such as Nolan⁽¹³⁾ and Kapp⁽¹⁴⁾ argue that *stimming* plays a role in sensory self-regulation, coping with environmental stressors, and alleviating intense emotional states, and should be understood beyond a pathologizing lens. However, when exhibited with high frequency, duration, or intensity, these behaviors can act as severe behavioral barriers^(15,16). Stereotypy can directly compete with the acquisition of academic, functional, and social repertoires, in addition to causing stigma and social isolation for the individual and their family^(9,12,17).

Epidemiological studies and literature reviews indicate a high prevalence of stereotyped behaviors in populations with autism. Chebli and Lanovaz⁽¹⁸⁾ identified a prevalence of up to 88% of stereotyped behaviors in individuals with autism within the group with developmental delays. In a meta-analysis conducted by Melo⁽¹⁹⁾, the average prevalence found was 51.8%. Given this, the reduction or modification of stereotypies that pose physical risks or cause social limitations remains one of the intervention targets in Applied Behavior Analysis (ABA)⁽²⁰⁾.

Applied Behavior Analysis posits that stereotypies are not “empty” responses or responses without an operant function, but are maintained by reinforcement schedules⁽²¹⁾. They are often maintained by automatic reinforcement⁽²²⁾, in which the very emission of the response produces sensory stimulation (visual, auditory, tactile, or vestibular) that strengthens the behavioral class. In other contexts, they may be maintained by negative reinforcement (avoidance or escape from aversive demands) or by positive social reinforcement (attention or access to tangible items)⁽²³⁾.

To design ethical and effective interventions, the literature emphasizes the need to identify the operant function of the response before determining the procedure^(24,25). Experimental Functional Analysis, as outlined by Iwata⁽²⁶⁾, allows for the isolation of antecedent and consequent environmental variables by systematically manipulating operant conditions (Control, Alone, Attention, Demand, and Tangible)^(27,28).

Among the behavioral analysis procedures used to reduce stereotypies, the following stand out: Differential Reinforcement schemes—such as Differential Reinforcement of Alternative Behavior (DRA), Differential Reinforcement of Incompatible Behavior (DRI), and Differential Reinforcement of Other Behavior (DRO)^(29,30)—and the Response Interruption and Redirection (RIRD) technique^(31,32).

The RIRD procedure, introduced into the treatment of autism by Ahearn⁽³³⁾, consists of presenting instructions, motor/vocal prompts, or

distractors immediately after the stereotypy is performed, thereby blocking or interrupting the interfering response and redirecting the child toward an adaptive or incompatible behavior. Several studies have demonstrated the effectiveness of RIRD for vocal and motor stereotypies^(34–37).

Schumacher and Rapp⁽³⁸⁾ evaluated the immediate and subsequent effects of RIRD on vocal stereotypies using a multiple-factor design with a three-component multiple-schema (no interaction, RIRD, and no interaction) in 10-minute sessions. The authors observed an immediate reduction in vocal stereotypy during the RIRD component. However, they noted that the 10-minute intervention duration might be too short to produce sensory satiation or deprivation and questioned the technique's efficacy when extended to motor stereotypies.

Aiming to fill gaps in the literature, the present study conducted a systematic replication of Schumacher and Rapp⁽³⁸⁾ with the following modifications: a focus on interfering motor stereotypies; an extension of the RIRD intervention session from 10 to 20 minutes; and the introduction of the experimental variable of attention contingent on adaptive responses in a counterbalanced design (RIRD with attention versus RIRD without attention). The objective of this study was to investigate the effects of time extension and the role of social attention on the efficacy of the RIRD procedure

for motor stereotypies maintained by automatic reinforcement.

METHOD

Ethical Considerations

Parents and guardians signed the Informed Consent Form (ICF). The requirement for children to sign the Informed Consent Form (ICF) was waived due to the participants' level of behavioral development and age group of the participants. The study was approved by the Ethics and Research Committee under CAAE No. 55684216.2.0000.5166

Location, Materials, and Instruments.

Data collection took place over 3 (three) months at a teaching clinic for Applied Behavior Analysis in the interior of the state of São Paulo. The sessions were conducted in a structured consultation room equipped with two tables, two chairs, a cabinet, and audiovisual equipment (video cameras and recorders). The sessions lasted approximately 45 minutes.

The measurement and assessment tools used included:

Experimental Functional Analysis Protocol: Used to record the frequency, antecedents, and consequences of motor responses under analogous conditions.

Duration Recording Protocol: Recording of the continuous duration of engagement in the target behavior using a manual stopwatch.

Repetitive Behavior Scale (RBS-R)^(39,40): Mapping of participants' repetitive motor patterns.

VB-MAPP⁽⁴¹⁾: Assessment of the milestones of development verbal and the behavioral barriers of the participants.

Participants

Two children with a formal diagnosis of Autism Spectrum Disorder (F84) participated in the study. The baseline characteristics and target stereotypies of each participant are detailed in the following paragraph and summarized in Table 1.

P1 was a 10-year-old girl. On the VB-MAPP (Level 1), she scored 22.5 points (a deficit compared to the 45 points expected for 18 months). She exhibited a lack of tact, reliance on physical prompts, delayed echolalia, and the presence of severe barriers (self- and hetero-aggression, hyperactivity, and avoidance of instructions). The target stereotypies were hand *flapping*, chest punching, and head punching (self-injurious behavior). P2 was an 11-year-old boy. On the VB-MAPP, he scored 40.5 on Level 1 and 41.5 on Level 2. He had a broad vocabulary (over 200 words) and well-developed imitation and echolalia repertoires, but exhibited intraverbal difficulties, low frustration tolerance, and sensory hypersensitivity. The target stereotypies were hand *flapping*, finger fidgeting, and trunk *rocking*.

Table 1 presents a structured overview of the initial characteristics of the study participants.

Table 1. Characteristics of the Participants

Participant	Age / Diagnosis	Gender	Target Motor Stereotypies
P1	10 years old / ASD (F84)	Female	Head punching, Hand flapping, Chest punching
P2	11 years old / ASD (F84)	Male	Finger movements, Body rocking, Hand flapping

Note: In accordance with guideline 3.6, this table must be formatted with single spacing in the final document

Source: Prepared by the author (2026).

Experimental Procedure

The procedure followed sequentially structured stages: 1. Selection & Consent. 2. RBS-R & VB-MAPP Mapping. 3. Experimental Functional Analysis. 4. Baseline (3 sessions). 5. Pairing Procedure (4 sessions). 6. Alternating Intervention: RIRD Without Attention vs. RIRD With Attention.

1. Identification and Selection of Targets: Based on the RBS-R and direct observations, three topographies were selected per participant, justified by learning difficulties (occurring 50% to 90% of the time during the initial observation) or physical risks.

2. Experimental Functional Analysis: Conducted based on Iwata's methodology⁽²⁶⁾. The Attention, Demand, Alone, and Control conditions were tested. The initial analysis confirmed that the motor stereotypies of P1 and P2 were maintained by automatic reinforcement (high rates in the Alone condition).

3. Pairing Establishment: Four sessions (2 days) were conducted to pair the applicator with highly preferred items, using strategies such as proximity, specific praise, imitation, and the absence of aversive demands⁽⁴²⁾.

4. Preference Assessment: Multiple Stimuli Choice Without Replacement (MSWO) assessment⁽⁴³⁾ administered daily before each session to determine the hierarchy of reinforcing items (books, slime, toys, Legos).

5. Experimental Design and RIRD Sessions: An alternating treatment design incorporating a three-component multiple schedule based on Schumacher and Rapp⁽³⁸⁾:

- **Component 1 (10 min):** No interaction (intra-session baseline). Signaled by an empty transparent jar on the table.
- **Component 2 (20 min):** RIRD

intervention. Signaled by a transparent jar containing highly preferred toys. Upon the occurrence of motor stereotypy, the researcher physically or verbally interrupted the response and redirected the animal with the instruction "*You can play if you want,*" presenting a toy that required the use of both hands.

• **RIRD Session Without Attention:** Handing over the toy without social validation or praise.

• **RIRD Session With Attention:** Handing over the toy accompanied by social attention, effusive praise, and interaction contingent on appropriate engagement.

• **Component 3 (10 min):** No interaction. Indicated by the empty jar, to assess immediate post-intervention effects.

Data Analysis and Reliability

The dependent variable was the cumulative duration (in seconds or as

a percentage of time) of engagement in stereotypies. The Inter-Observer Agreement Index (IOA) was calculated between the researcher and an independent observer in 30% of the sessions. The formula used divided the number of agreements by the sum of agreements and disagreements, multiplied by 100, resulting in a reliability index of 97%.

RESULTS

The results of the Experimental Functional Analysis indicated a predominance of stereotyped responses during the Alone condition for both participants. P1 and P2 maintained high rates of stereotypy in the absence of social consequences or external demands, indicating that the repetitive motor behaviors were maintained by automatic reinforcement.

The Reliability Index was calculated using the following equation:

$$IOA = \left(\frac{\text{Agreements}}{\text{Agreements} + \text{Disagreements}} \right) \times 100 = 97\%$$

Data from P1

For P1, engagement at baseline ranged from 50% to 60% for hand *flapping*, 20% to 30% for chest-pounding, and 15% to 20% for head-banging. During the RIRD components (20 minutes), engagement time across all topographies dropped dramatically, reaching a maximum of 6.1% in the first session and values close to zero in subsequent sessions. There was no significant difference in the levels of reduction when comparing the RIRD Without Attention and RIRD With Attention conditions.

When evaluating the duration in seconds across sessions over time, P1 showed a continuous downward trend:

- **Hand flapping:** decreased from approximately 710 seconds in the

first session to about 450 seconds in the seventh session.

- **Chest-punching:** decreased from approximately 340 seconds to less than 100 seconds.

- **Headbutting:** reduced from approximately 230 seconds to less than 100 seconds.

Data from P2

For P2, the baseline showed impairment of approximately 40% in hand *flapping*, 30% in trunk rocking, and 35% in finger movements. With the introduction of RIRD, the duration of stereotypies during the intervention component dropped to rates below 6.7% in the first session and remained at minimal levels throughout the study. As observed in P1, the "social attention" variable did not result

in a difference in the reduction of stereotypy compared to the no-attention condition.

The temporal analysis of the cumulative duration for P2 confirmed the progressive effect of the procedure:

- **Hand flapping:** decreased from approximately 450 seconds to about 150 seconds in the final session.
- **Trunk rocking:** decreased from approximately 350 seconds to about 150 seconds.
- **Finger movements:** decreased from approximately 360 seconds to about 150 seconds.

In 52% of the analytical sessions (11 out of 21 blocks), the third component (no interaction, post-RIRD) showed lower rates of stereotypy compared to the first component (no interaction, pre-RIRD), indicating the absence of a substantial rebound effect and suggesting residual suppression of stereotyped behavior.

DISCUSSION

The findings demonstrated the efficacy of RIRD in reducing motor stereotypies in children with autism, validating the pioneering data from Schumacher and Rapp⁽³⁸⁾ and expanding upon their conclusions. Extending the RIRD session duration from 10 to 20 minutes proved clinically feasible. This extended period allowed the learner greater exposure to contingencies that encouraged adaptive responses

incompatible with stereotyped motor behavior, thereby enabling regular reinforcement opportunities.

The absence of relevant statistical or behavioral variation between the alternating treatments (RIRD with attention versus RIRD without attention) is explained by the results of the Functional Analysis. Given that the stereotypies of P1 and P2 had an automatic function, physical blocking combined with redirection toward competing manipulative tasks directly acted on the sensory contingency. Thus, mechanical and functional redirection alone constitutes the primary active element in the intervention's effectiveness, eliminating the need for verbal social reinforcement to immediately suppress the repetitive motor response.

The results are consistent with current ethical guidelines in Applied Behavior Analysis^(17,25). When conducted without severe aversive components and combined with the teaching of adaptive/functional responses, RIRD serves to replace high-barrier behavior with functional engagement in the environment.

Limitations and Future Directions

Limitations of the present study include: (1) the sessions were conducted in a restricted clinical setting (consultation room), which limits direct inferences regarding generalization to natural contexts such as school or home; and (2) the fixed order of presentation of the initial conditions

(beginning with RIRD without attention).

It is recommended that future research: conduct formal generalization and maintenance (*follow-up*) tests involving parents, caregivers, and educators; randomize the order of the alternating conditions; and investigate the combination of RIRD with other behavioral interventions, such as Functional Synthesis Analysis and Functional Communication Training.

CONCLUSION

The present study demonstrated that the Response Interruption and Redirection procedure is effective in reducing the duration and frequency of interfering motor stereotypies in children with autism. Extending the intervention component to twenty minutes sustained the continuous reduction in behavioral rates, demonstrating that structured functional redirection is capable of mitigating behaviors maintained by automatic reinforcement.

Additionally, the absence of a disparity between the attention-focused and non-attention-focused conditions reaffirms that immediate motor redirection toward preferred items acts as a response-class modifier. The procedure has established itself as a safe, replicable, and evidence-based intervention tool capable of mitigating developmental barriers and expanding the child's opportunities for learning and social integration.

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