

RESEARCH ARTICLE

EFFICACY OF RESPONSE INTERRUPTION AND REDIRECTION IN REDUCING STEREOTYPIC VOCALIZATIONS EXPERIENCED BY INDIVIDUALS WITH AUTISM SPECTRUM DISORDER: A SYSTEMATIC LITERATURE REVIEW

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Abstract

..... This paper aims to investigate the efficacy of Response Interruption and Redirection in reducing vocal stereotypy in individuals with Autism Spectrum Disorder. A systematic review of literature from 2003-2023 of studies sourced from Google scholar, Google advanced search, PsychInfo etc. implementing RIRD was conducted. The current review sought to examine the studies to address certain questions like the factors impacting the efficacy of reducing stereotypic vocalisations and increasing appropriate vocalisations and the efficacy of RIRD alone or along with other intervention procedures. Analysis revealed that the effectiveness of RIRD is not contingent upon the number of sessions in which it is implemented and instead on other factors like the nature of reinforcement and participant characteristics. Further, the effectiveness of RIRD-alone and RIRD implemented with other procedures was assessed and it was revealed implementing RIRD with another intervention can enhance its effectiveness.

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Introduction:-

Vocal stereotypy is a nonfunctional or noncontextual speech that excludes functional responses to the experimenter's vocal antecedents(Ahearn et al. 2007). Examples include singing, babble, laughing, repetitive grunting, squealing, and words or phrases (Frewing et al., 2015; Wells et al, 2016,Scull, 2015). In children, vocal stereotypy is characterized by repetitive sounds, words, breathing, and delayed echolalia of previously heard dialogues(Cividini et al., 2019; Shepherd &Leigh, 2010; Cassella et al., 2011)). This can be detrimental to social interactions and interfere with the development of new skills (i.e., is automatically maintained; Rapp & Vollmer, 2005). This repetitive, noncontextual motor and vocal behavior is a hallmark of autism spectrum disorder and can persist without social consequences. Despite being a prevalent psycholinguistic impairment, little is known about the prevalence of vocal stereotypy in individuals with autism spectrum disorder.

Stereotypes in children with ASD are maintained by automatic, sensory, or social reinforcements (Dunlop, 2012; Lovaas et al. 1987; Vaughn & Michael, 1982). Stereotypical vocalizations are automatically reinforced without context, leading to social awkwardness and hindering deep connections with others (Scully, 2016). This behavior is not mediated by social interaction, contrary to most researchers' beliefs. Lovaas et al.(1987) suggest that individuals receive sensory input through stereotyped response mechanisms, generating reinforcement on their own. Perry

Corresponding Author:- Dr. Mandeep Kaur Arora Address:- Associate Professor Department of Psychology Kamala Nehru College University of Delhi. (2013) suggests vocal cord vibrations may perpetuate vocal stereotypy, potentially affecting children with ASD who may not pay attention to vocal cues.

Stereotypy, a behavior common in both children and autistic children, is difficult to treat due to automatic reinforcement(Schumacher & Rapp, 2011). Research shows that without appropriate therapies, autistic children's stereotypy levels increase with age. The study by Cividini et al. (2019) suggests a correlation between autistic symptom severity and stereotypy, with higher prevalence observed in individuals with intellectual difficulties and ASD (Scully, 2015). It is more common in individuals with intellectual difficulties and ASD, with up to 60% displaying stereotypy (Wunderlich & Vollmer, 2015).

Various behavioral intervention techniques are used to minimize vocal stereotypy, including differential reinforcement, inhibitory stimulus-control, matched stimulation, discriminative training, and Response Interrupting Behaviour Disorder (RIRD).

Reynolds (1961) first described DRO as an intervention in which providing a positive reinforcer when the target response does not occur for a given period of time may avoid the undesirable side effects of aversive procedures and at the same time effectively reduce responding. DRO decreases negative behavior by offering positive outcomes in exchange for ceasing negative behavior for a predetermined time. (Wong et al.,2013) Inhibitory stimulus-control procedures are antecedent-based strategies that have shown efficacy (Healy et al, 2018). Hearst et al. (1960) first defined an "inhibitory stimulus" as a stimulus that decreases response strength during conditioning, while external stimuli can be classified as excitatory or inhibitory that increases operant behavior. Matched stimulation enriches the surroundings by matching sensory consequences with the function of problematic behavior. Discrimination training, as first described by O'Connor et al (2011) is a teaching procedure that withholds reinforcement of the same behavior in the presence of other stimuli and reinforces specific behavior in the presence of certain stimuli.

Tact training and mand training come under the purview of a procedure called verbal operant training. Verbal operant training is based on the framework established by Skinner (1957), and defines verbal operants according to their controlling antecedent and consequent events. Skinner defined the tact as a verbal operant that is evoked by a nonverbal stimulus, such as an object or an event, and is maintained by nonspecific reinforcement such as a generalized or social reinforcer. In comparison, mands refer to a verbal operant maintained by specific consequences related to a motivational operation (Laraway, Snycerski, Michael, & Poling, 2003),

Response interruption and redirection (RIRD) is a behavioral intervention used to reduce self-harming, stereotypical, and repeated actions. It involves making demands or using distractions to stop disruptive conduct and redirect it to a more suitable reaction. RIRD is primarily used to treat repetitive, stereotypical, and self-injurious behaviors.Research (Rapp & Vollmer, 2005; Ahearn, Clark, McDonald, & Chung, 2007) ishows automatic reinforcement can perpetuate stereotypy, and RIRD intervention was used to address vocal stereotypy, requiring prompting while maintaining eye contact and neutral tone.

Response Interrupting Behaviour Disorder (RIRD) is a treatment approach that focuses on stopping stereotypy and encouraging alternative responses(Frewing et al., 2015). It involves completing motor or vocal tasks and rewarding compliance (Cividini et al., 2019). RIRD-based interventions comply with ethical guidelines and avoid harsh techniques or punitive measures until all avenues of reinforcement have been explored. The therapist's social reinforcement is linked to response blocking of stereotypies in RIRD. Vocal stereotypy is often reduced due to sensory repercussions and is incompatible with complying with vocal commands(Esposito et al., 2021). Almost all individuals experience concurrent increases in appropriate vocalization when responses are interrupted or redirected. Three theories are proposed regarding the relationship between vocal stereotypy and appropriate vocalization: participants may react or engage in appropriate stereotypy consistently with competitive social reinforcement, higher frequencies of AV may inhibit VS, and both processes may occur simultaneously (Dickman et al., 2012].

The RIRD intervention effectively reduces vocal stereotypy in children (Schumacher & Rapp, 2011), similar to response blocking for motor stereotypy. It is useful for several reasons, including its conceptual similarity to positive practice(and its ability to prevent vocal stereotypy by using incompatible responses Foxx & Azrin, 1973). RIRD can be seen as a sensory extinction procedure, temporarily blocking automatic reinforcement contingency, thereby causing behavioral change(Perry, 2013).

Purpose of the study

The effectiveness of RIRD as a behavioural intervention for reducing vocal stereotypy remains unclear, despite its use in numerous studies(Wong et al., 2014; Healy et al., 2013). The study aims to determine RIRD's efficacy through a literature review, considering the frequency of verbal stereotypy in individuals with ASD and the potential impact of session frequency(Miguel et al. (2009) . It also seeks to analyze RIRD's efficacy when it is implemented along with other procedures and explore factors influencing its effectiveness, such as the therapist, environment, and reinforcer type(Healy et al., 2013). We hope to evaluate the increase in suitable vocalisations as a result of these different conditions through our study.

Research Questions

- 1. What are the factors that impact the effectiveness of RIRD sessions in reducing vocal stereotypy and increasing appropriate vocalizations in individuals with ASD?
- 2. What is the effect of implementing RIRD with other procedures (DRO, SS pairing etc) when reducing vocal stereotypy in individuals with ASD?

Method:-

Literature search

To identify studies for analysis, research assistants conducted computerized research for children and adolescents with ASD for the last 20 years (2003- 2023). The searches were conducted using Google Scholar, Google Advanced Research and PsychInfo. All permutations of 3 categories of keywords: ASD/ Autism spectrum disorder, children/adolescents and Response interruption and Redirection (RIRD) were entered into the search databases. The research assistants were provided with screening criteria, which included participants with ASD/ Asperger's in the age range of 0-20 who showed vocal stereotypic behaviour.

Following the completion of the literature research, the reference sections of the articles were examined to locate additional research.

Inclusion/Exclusion criteria

If the abstract of the identified article indicated the behavioural interventions for ASD (i.e., Autistic disorder, Asperger's disorder, or PDD-NOS), they were included in the study. The criteria for inclusion in this review were: (a) application of either response redirection, RIRD, or either of these techniques used in combination with other strategies, to reduce vocal stereotypy (b) a diagnosis of ASD (c) the intervention targeted stereotypic behaviour (especially vocal stereotypy) (d) the article was published in the last 20 years. Certain studies were excluded because they did not meet the appropriate research design (eg. meta-analysis, group subject design). These initial search procedures resulted in 20 articles.

Across the 20 studies, 40 participants with a mean age of 7.412 (age range- 3-19) were included. All the participants had been diagnosed with ASD and showed vocal stereotypic behaviour. The studies have been tabulated in Table 1.



Figure 1:- Figure 1 shows the screening process.

Dependent and Independent Variable

The dependent variable in this review is Vocal Stereotypy. Vocal stereotypy, in majority of the studies, was operationally defined as any instance of nonfunctional or noncontextual speech—including singing, laughing, grunting, squealing, and words or phrases unrelated to the present situation. The independent variable of this review is Response interruption and reduction (RIRD). According to Cividini et al. (2019), response interruption and reduction involve interrupting stereotypy and redirecting the individual to complete a series of motor or vocal tasks. In addition, praise is usually provided for compliance with these tasks, and in some iterations of RIRD, reinforcers are also delivered contingent on play and/or appropriate vocalizations.

Table 1:- S	Summary of	of included	articles listed b	y de	pendent V	/ariable (Ste	reotypy	Voca	alization)	and l	[V is	RIR	2D

						JIJ		
S.	Citation	N/ mean	Objective	Procedure	No. of	Nature of	Therapists	Percentage
No.	(APA)	age			sessions	reinforcer		of
						used		improvement
	Ahearn, et	N=4	Increase	RIRD	<50	Verbal	separate	10% increase
	al.(2007)	7(3-	AV	alone			for each	3% increase
		11years)					participant	10% increase
								38% increase
2.	Macpherson	N= 4	Increase	RIRD	Between	Verbal	Same for	55% decrease
	(2007)	7.5(6-12	AV	alone	50-100		each	41.6%
		years)					Participant	decrease
								20% decrease
								50.8%

								decrease
3.	Leigh &	N= 2	Decrease	RIRD	>100	Verbal,	Not	49% decrease
	Shepherd (2010)	11(10-12 vears)	VS	alone		Tactile	mentioned	50% decrease
4.	Ahrens et al	N=4	Increase	RIRD	50-100	Verbal	Separate	27% increase
	(2011)	4.5 (4-5	AV (2	alone			for each	11.5%
		years)	participants)				participant	increase
		2	& Decrease				1 1	39% decrease
			VS (2					34% decrease
			participants)					
5.	Colon et al	N=2	Decrease	RIRD +	50-100	Edible	Same for	5.2%
	(2013)	9.34 (8-	VS	Tact &			each	decrease in
		10		Mand			participant	VS
		years)		Training				5.6%
								decrease in
								VS
	Love et al	N=2	Decrease	RIRD	50-100	Tactile	Same for	5.8%
	(2013	8.5 (8-9	VS	+Matched			each	reduction
		years)		Stimulation			participant	7% reduction
7.	Cassella et	N= 2	Increase	RIRD	<50	Tactile	Separate	6% increase
	al (2011)	5.5 (7-	AV	alone			for each	in AV
		11					participant	3% increase
		years)						in AV
8.	Schumacher	N= 2	Decrease	RIRD	<50	Verbal	Not	No Numerical
	& Rapp	6.5 (5-8	VS	alone			mentioned	Value given
	(2011)	years)						Reduced to
								zero
			-		7 0			stereotypy
9	Dickman et	N=1	Increase	RIRD +	<50	Tactile	•	30.67%
	al (2012)	5 years	AV	DRO				reduction in
			Decrease					VS 25.750/
			vs					23.75%
10	Destrone et	N- 2	Decrease	PIPD	<50	Tactile	Same for	Av 9% reduction
10.	a1(2013)	75(6-9)	VS	alone	<50	Tactile	each	in VS
	ai (2013)	vears)	•5	aione			narticipant	8% reduction
		yearsy					purticipunt	in VS but
								decrease not
								maintained in
								subsequent
								conditions
11.	Perrv	N= 2	Decrease	RIRD	<50	Verbal	Separate	77% decrease
	(2013)	4.5 (4-5	VS	alone			for each	in VS
		years)					participant	No reduction
								in VS
12.	Joung	1 (10	Decrease	RIRD	<50	Verbal	•	20%
	(2011)	years)	VS	alone				reduction in
			<u> </u>					VS
13.	Miguel et al	1 (4	Decrease	RIRD +	<50	Tactile	•	40.2%
	(2013)	years)	VS	Medicine				reduction in
								VS, in long
								term,
								sertraline not
								effect in

								reducing VS
14.	Wells et al (2016)	13 years	Decrease VS	RIRD alone	<50	Verbal	•	45.2% decrease in VS
15.	Shawler & Miguel (2015)	N= 5 8.4 years	Decrease VS	RIRD alone	Between 50-100	Tactile	Separate for each participant	54% decrease38.2%decrease20%decrease
								46% decrease 28.8% decrease
16.	Scully (2016)	N=1 7 years	Decrease VS	RIRD alone	<50	Visual	-	58.4% reduction
17.	Frewing et al (2015)	N=1 19 years	Decrease VS	RIRD + Stimulus Control	<50	Verbal, Visual	-	77% reduction
	Cividini et al (2019)	N= 3 5 years	Decrease VS	RIRD+ DRO	<50	Tactile, Edible	Separate for each participant	12% decrease
19.	Sloman et al ., .,(2022)	N=2 13 (12- 14 years)	Decrease VS	RIRD + Stimulus control	>100	Visual	Separate for each participant	70% increase in SC 80% increase in SC
	Callahan et al .,(2023)	N=3 5.3 (3-7 years)	Decrease	RIRD + Stimuls Control	<50	Tactile	Separate for each participant	83% reduction in VS
								93.2% reduction in VS
								97.5% reduction in VS

Certainty of Evidence

The certainty of evidence in this case is reduced due to the lack of numerical values in two investigations, making determining the degree of the effect in those situations problematic. The evidence from the 18 research that do provide numerical figures in the form of percentage reductions in vocal stereotypy and increases in appropriate vocalization in Autism Spectrum Disorder, on the other hand, suggests a trend toward improvement in vocal behavior. Given the consistency of findings across the majority of research, the overall certainty of evidence may be moderate, although it would be stronger if the two studies lacking numerical values were also included and gave more specific information.

Data Extraction

We methodically reviewed a large pool of over 40 studies relevant to a specific research topic in a review conducted by seven scholars. Our research found that RIRD was significantly more common in the collected literature. To acquire a better understanding of this phenomenon, the research team manually extracted data from these investigations. This careful data extraction technique aims to gather significant information into a tabular format, allowing for a more organized and comprehensive understanding of the findings from the research. This methodical technique enabled more in-depth data analysis and improved the capacity to draw meaningful inferences from the aggregate research findings.

Analysis

The studies were categorised on the basis of certain criteria like the number of sessions, nature of reinforcer used and whether the same or separate researcher implemented the intervention. The percentage of improvement/reduction in appropriate vocalisations/ vocal stereotypy was then examined from the studies by looking at the baseline and the last session of the intervention. This analysis has been tabulated in table 2.

Findings And Discussion:-

The findings of the study indicate that factors like participant characteristics, presence of reinforcement and nature of stimuli affect the efficacy of RIRD in reducing vocal stereotypy and increasing appropriate vocalisations. However, interestingly it was found that the number of sessions in which RIRD was implemented does not seem to have much of an impact on the reduction of vocal stereotypy. It was also found that implementing RIRD along with other procedures like Differential Reinforcement of other behvaiour, Stimulus-Stimulus Pairing etc can help increase the effectiveness of RIRD in reducing vocal stereotypy.

Research Question 1: What are the factors that impact the efficacy of **RIRD** in reducing vocal stereotypy and increasing appropriate vocalisations in individuals with ASD?

The range of reduction in vocal stereotypy in all the studies that were used was 0 to 97.5%. Since all the studies that were implemented used RIRD, we examined other factors that might have impacted the reduction in stereotypic vocalisations.

Participant characteristics

In the study by Perry, 2013, there was 0 reduction in stereotypy for one participant. The participant was already engaged in an EIBI program on top of which RIRD was implemented. According to Perry (2013), the participant may have had problems with discrimination between RIRD and EIBI tasks, which could account for the ineffectiveness of RIRD in decreasing his vocal stereotypy. Also, the researcher mentioned that during RIRD trials in the present study, it was particularly difficult to determine if vocal responding was rhythmic in nature because therapists interrupted the behaviour immediately. It was thus not clear whether the participant's behaviour was vocal stereotypy or a vocal tic. In terms of clinical phenomenology, stereotypies tend to be more fixed, rhythmic, and prolonged in duration than tics, which are rapid and fluctuating in both intensity and frequency. The approach to dealing with a tic would be different than stereotypy. Similarly, the study by Pastrana et al (2013) reported only an 8-9% decrease in vocal stereotypy which may be because since the study implemented RIRD on both motor and vocal stereotypy, after stimulation generated by motor stereotypy was restricted. In many studies, it can be noticed that praise and reinforcement withRIRD provided by the teacher/ therapist can increase appropriate vocalisations and decrease vocal stereotypy. Colon et al (2010) conducted a study in which only a 5.2% and 5.6% decrease in vocal stereotypy was observed when RIRD was implemented. According to the researcher, this might have happened because the participants responded better to verbal operant training being conducted before RIRD was introduced.

In the study by Callahan (2022), participant 3 showcased a 97.5% decrease in vocal stereotypy and showed a substantial increase in contextual vocalizations. According to the researcher, this may have occurred because, as his behaviour analyst reported, emitting "correct" answers and social interactions appeared to function as reinforcers for the participant as compared to others. The study by Frewing et al (2015) showcased a 77% decrease in vocal stereotypy. Such a substantial decrease might be because the participant had received intensive ABA treatment since the age of 4 and spoke in complete sentences which might have affected how perceptive the participant was to the intervention. Thus, the participant characteristics play a role in the effectiveness of RIRD.

Presence of Reinforcement & Nature of reinforcer

In the study by Ahearn et al (2007), appropriate vocalizations in participant 4 increased by 38%. This could be because teachers praised the use of appropriate speech and honoured those requests that could be accommodated. The demand behaviour in 3 of the participants also increased which seemed to further reduce vocal stereotypy. Thus, the accommodation and praise by the therapist or teacher could help in increasing the correct vocal behaviour. Adding to the evidence for the effectiveness of reinforcements in increasing AV, Dickman et al (2012) found that an increase in the rate of AV via additional extrinsic reinforcers (tokens) led to further suppression of VS, suggesting that the rate and quality of reinforcement for AV is a significant variable. In this study, edible items were used as reinforcers for appropriate behaviour which led to a 25.75% increase in appropriate vocalizations. However, it becomes important that the reinforcers used by the experimenter can effectively be manipulated by the

participant. In the study by Cividini et al (2019), DRO+RIRD was used but there was no increase in appropriate vocalizations. An edible reinforcer along with a tactile reinforcer (tablet) was used to positively reinforce AV. However, in the case of item engagement, consumption of the reinforcer was incompatible with that response. The participant could not effectively access edible items due to already holding a tablet. According to the researcher, perhaps reinforcing item engagement with access to only small edibles, that could be quickly consumed, may have been a better alternative. The importance of the use of reinforcement, positive or negative, in actually making RIRD effective is substantiated by a study done by Cassella et al (2012). In this study, no increase in appropriate vocalizations was noticed and the decrease in vocal stereotypy was not maintained in the absence of RIRD. This might be because the toys were not removed during treatment, contingent on vocal stereotypy. Non-contingent access to toys could have contributed to no increase in appropriate vocalisations. Further, this can be supported by the results from the study by Pastrana et al (2013) where, in the absence of praise for appropriate behaviour, no substantial decrease in vocal stereotypy was found. Similarly, Leigh & Shepherd (2010) reported minimal increase in appropriate vocalisations. According to the researcher, appropriate interactions never contacted reinforcement in the form of praise that would potentially lead to an increase in the highly desired behaviour.

Number of sessions

Studies that implemented RIRD in less than 50 sessions (Ahearn et al, 2007; Cassella et Al 2011; Schumacher & Rapp, 2011; Joung, 2011; Dickman et al, 2012; Pastrana et al, 2013; Perry, 2013; Miguel et al, 2013; Frewing et al, 2015; Scully, 2016; Wells et al, 2016; Cividini et al, 2019; Callahan et al, 2023) showed reduction in vocal stereotypic behaviour that ranged from 0 to 97.5%. There were 5 studies (Macpherson, 2007; Ahrens & Lerman, 2011; Colon et al, 2013; Love et al, 2013; Shawler & Miguel, 2015) that implemented RIRD in about 50-100 sessions. The reduction in stereotypic vocalisation ranged from 5.2% to 55%. Thus, the number of sessions does not seem to hold a match of relevance to the reduction in vocal stereotypy.

Research Question 2: What is the effect of implementing **RIRD** with other procedures (**DRO**, SS pairing etc) when reducing vocal stereotypy in individuals with ASD?

In studies that show less reduction in vocal stereotypy, it can be seen that implementing RIRD along with other behavioural training can be helpful in reducing VS.

In the study by Colon et al (2013), there was only a 5.2% decrease in vocal stereotypy in one of the participants, Anna. RIRD was not designed to target increases in specific types of appropriate language (i.e., individual verbal operants) which could explain why it was only moderately effective in reducing vocal stereotypy. For Anna, tact training and RIRD separately produced mild suppressive effects on stereotypy; however, much greater effects were observed when both components were in place. Similarly in the study by Love et al (2013) RIRD alone was not as effective in reducing vocal stereotypy as the RIRD+MS condition, wherein a matched item (auditory toy) was used as negative reinforcement. This also increased appropriate vocalisations (6.75% increase for participant 1). According to the researcher, the observed reduction in vocal stereotypy in the presence of MS may have been a result of the toys' auditory stimulation functioning as an abolishing operation for the product of vocal stereotypy.

According to Scully (2016) using discrimination training can be helpful in increasing the effectiveness of RIRD. In the study, the researcher reported a 58.4% decrease in vocal stereotype and this was because the use of a multiple-schedule intervention (elaborate) worked effectively in positively introducing the implementation of RIRD. It appears using a multiple schedule initially provides the student with positive support which can be faded as discrimination training of multiple stimuli is maintained by the student. This allows for an easier transition for the student engaged in vocal stereotypy, as opposed to starting with the implementation of RIRD intervention. The multiple schedule intervention was implemented by teaching the participant to discriminate between a red card and a green card condition which helped in the effective intervention of RIRD. This evidence for discrimination training can further be found in a study by Frewing et al (2015) where there was a 77% decrease in vocal stereotypy. Here, stimulus control with the help of a wristband established discrimination between the RIRD and non-RIRD conditions. According to the researcher, RIRD with SC produced immediate decreases in stereotypy and no subsequent increases or decreases when the intervention was removed.

Thus, it can be concluded that when RIRD is implemented along with another procedure, it seems to be more effective than when it is implemented alone.

Limitations and future directions

The fundamental constraint of this study is the minimal number of included studies, with just 20 studies examined. Extending the scope to include studies that implement RIRD in more than 100 trials could provide a more complete picture of the RIRD technique's effectiveness in lowering Vocal Stereotypy in the Autism Spectrum Disorder population. Another disadvantage is that we only examined the RIRD technique. Future study could benefit from incorporating a variety of assessment methodologies, broadening the range of ways to reduce vocal stereotypy in ASD. While this analysis provides useful guidance, additional research is required to create a more nuanced and fuller grasp of the topic. Increasing the body of literature in this topic will lead to more clarity and robust findings. Another shortcoming of this review is the lack of robust statistical analysis. More advanced statistical approaches should be used in future study to increase the validity of the findings and draw more precise conclusions. This review did not investigate the impact of socio-cultural factors on the efficacy of interventions like RIRD in different cultural contexts. Future research should take these viewpoints into consideration in order to account for any cultural differences in intervention effectiveness. There is potential for additional examination of the use of edible reinforcers in future RIRD procedures. More in-depth research and analysis are needed to better understand its impact on lowering vocal stereotypy in the Autism Spectrum Disorder population.

Conclusion:-

The aim of the present study was to understand the efficacy of RIRD in reducing vocal stereotypy in individuals with ASD with the help of a systematic review of literature, investigated studies published in this field in the last 20 years (2003-2023). The analysis of the 20 studies that had been selected through an inclusion criteria led to some interesting findings. Effectiveness of RIRD does not seem to be contingent upon the number of sessions in which it is implemented and instead on other factors like the nature of reinforcement and participant characteristics. The type of reinforcement used to reinforce appropriate vocalizations and reduce vocal stereotypy is critical, with verbal reinforcement (praise, interaction) being largely effective. Further, we have found that using RIRD with another intervention can enhance its effectiveness rather than using it alone.

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