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Play on words: Assessing the influence of language context on repetitive speech in
children with Autism Spectrum Disorder

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Play on words: Assessing the influence of language context on
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Abstract

Purpose: Although repetitive speech is widely documented in children with Autism Spectrum Disorder (ASD), the influence of structure in the language context on the use of repetitive speech remains unknown. This information is essential for clinicians to efficiently target this pervasive autism-related symptom in intervention. The purpose of this study was to determine if the degree of structure of the language task impacts the frequency and type of repetitive speech.

Method: This study explored repetitive speech use in four school-aged, male children with ASD in two different language tasks: storytelling (more-structured) and play-based (less-structured). Language samples were collected, orthographically transcribed, and coded for four types of repetitive speech: immediate echolalia, delayed echolalia, verbal stereotypy, and vocal stereotypy. The frequency and type of repetitive speech were analyzed.

Results: Participants produced more utterances overall during the play-based context, but produced less repetitive speech during the storytelling task. There were no notable differences in the types of repetitive speech between the two tasks.

Conclusions: In intervention, children with ASD may rely less on repetitive speech during more-structured (albeit still naturalistic) language tasks than less-structured tasks. To confirm these exploratory results, future research with larger sample sizes and longer language samples are needed.

Introduction

A highly prevalent feature of Autism Spectrum Disorder (ASD) is repetitive speech. In fact, these repetitive productions have been reported to be present in 75% - 100% of all children with ASD (Lanovaz & Sladeczek, 2012; Rutter, 1968; Shield, Cooley, & Meier, 2017; Wing, 1971). Both typically developing children and children with other disabilities can also exhibit repetitive speech (Lanovaz & Sladeczek, 2012; MacDonald et al., 2007; Shield et al., 2017; Schuler, 1979; Van Santen, Sproat, & Hill, 2013), but, repetitive speech occurs at an even greater frequency in children with ASD (Stiegler, 2015). Repetitive speech is a significant component to an individual with ASD's verbal behavior (Prizant & Rydell, 1984). To be diagnosed with ASD, an individual must exhibit "stereotyped or repetitive motor movements, use of objects, or speech" (e.g., echolalia or idiosyncratic phrases) (American Psychiatric Association, 2013, p. 50). Repetitive speech productions occur in a systematic manner – they consistently use the same linguistic, rhythmic, and prosodic patterns, and exhibit the child's communicative style (Sterponi & Shankey, 2014). These unique utterances are made up of explicit repetitions or irregular utterances. Repetitive productions are not specific to speech; highly repetitive signed productions are used by children who are deaf with ASD (Shield et al., 2017). Repetitive speech is a hallmark feature of ASD.

There is dearth of research to assist clinical professionals in understanding the causes or appropriate interventions for repetitive speech in children with ASD. This lack of understanding fuels an ongoing debate over how best to approach repetitive speech to improve an individual's language (Stiegler, 2015). Knowing what types of language tasks lead a child with ASD to rely more on repetitive speech has major implications for enhancing his quality of life. For example, repetitive speech use influences how others' perceive children with ASD, which has social

ramifications (Lanovaz & Sladeczek, 2012; Paul et al., 2005). If clinicians learn what kind of language task allows an individual's language to be less repetitive, one's quality of life could potentially be improved.

In examining the roots of repetitive speech, researchers have searched for ways to reduce children with ASD's reliance on repetitive speech by adjusting the structure of communicative partner's questions and feedback, as well as the structure of intervention (Fay, 1975; Foxx, Faw, McMorrow, Kyle, & Bittle, 1988; Hetzroni & Tannous, 2004; Huppe, 2008; Prizant, Wetherby, Rubin, & Laurent, 2003; Rydell & Miranda, 1991). But, no one has yet considered whether the nature of the language task itself influences the use of repetitive speech. This is the primary goal of this study.

The Controversary

It is not known why individuals with ASD produce repetitive speech. "The limited understanding of echolalic behavior may be caused partially by confusion of terminology and lack of detailed descriptions of the behaviors observed, confounded by the differences in philosophy and methodology of the various disciplines involved" (Stiegler, 2015, p. 750). Van Santen (2013) also believes objectivity, change in diagnostic criteria, and accuracy in measurement of repetitive speech contributes to this lack of knowledge. Before clinicians can appropriately treat repetitive speech, a better understanding of these unique productions should be obtained.

Some researchers believe repetitive speech hinders one's language development. Foxx directed a study (1988) to see if individuals with intellectual disabilities could replace echolalic productions with appropriate utterances, and referred to echolalia as maladaptive speech. This term implies that repetitive speech is harmful (Foxx et al., 1988) and therefore, impacts the

potential of an individual's independent living (Paul et al., 2005). Throughout Huppe's (2008) study, she used the terms "eliminate" and "replace" to describe Applied Behavioral Analysis (ABA) therapy as a form of intervention for repetitive speech. A similar intervention, named differential reinforcement of omission of behavior, includes a fixed time schedule with negative reinforcement to decrease vocal stereotypy (Taylor, Hoch, & Weissman, 2005). These researchers approach repetitive speech as a behavior that prevents individuals from communicating to their full potential, and therefore should be eliminated.

In contrast, other researchers have approached repetitive speech as a means to contribute to language development. Prizant believes there is often communicative intent or cognitive function behind their repetitive utterances (Prizant & Duchan, 1981; Prizant & Rydell, 1984). These individuals apply a communication strategy by using segmented memorized forms, which may be "a first step towards the acquisition of a rule-governed, generative linguistic system for echolalic children" (Prizant & Rydell, 1984, p. 184). This implies that repetitive speech is indeed helpful, and needs to be shaped to fully benefit the child. Additionally, "Kanner hypothesized that delayed echolalia represented an intermediate stage in movement from immediate echolalia to more flexible and creative language" (Prizant & Rydell, 1984, p. 184; Kanner, 1943). When a child has not yet learned how to appropriately respond, he may use a compensatory strategy to meet the social and/or linguistic demands (Rydell & Mirenda, 1994). A better understanding of how to approach intervention for repetitive speech is clearly needed. By determining the influence of different language contexts on whether the child's environment with ASD will rely on this repetitive speech communication strategy, clinicians could be one step further in improving intervention for these children.

Differing definitions. Another obstacle to better understanding why children with ASD produce repetitive speech has been the use of differing terminology across the ASD literature. Several labels have been used to describe the qualities of these unique productions. Some, but not all, include immediate echolalia, delayed echolalia, pure echoes, mitigated echoes, verbal stereotypy, and vocal stereotypy. Because there are so many used across the ASD literature, repetitive speech has been difficult to consistently define and quantify.

Broadly, the term *echolalia* is often agreed upon to mean one "echo(es) the utterances of others in the environment, or their own utterances, or any audio media" (Stiegler, 2015, p. 751). But, many researchers believe immediate and delayed echolalia are specific to modeling the communicative partner, rather than oneself or the media (Huppe, 2008). Repetitive productions that are repeated rigidly from the model utterance, are commonly defined as pure echolalia (Huppe, 2008). In these repetitions, the segmentals and suprasegmentals often mirror the model utterance (Sterponi & Shankey, 2014).

Immediate echolalia is commonly described as occurring within one or two conversational turns, and delayed occurs a brief time after. (Prizant & Rydell, 1984; Stiegler, 2015). The underlying communicative purpose behind these productions is thought to differ. For example, some researchers posit that immediate echolalia is meaningless because it is instantly repeated, but delayed echolalia is meaningful because the production is in a later context, signaling that the utterance was processed (Prizant & Duchan, 1981). But in contrast, others consider delayed echolalia to also lack meaning because it is a learned routine (Rydell & Mirenda, 1994). Even when there is agreement in terminology, disagreement in the underlying functions of these labels remain.

One of the most widely varying terms used to define repetitive productions is vocal stereotypy. Some use it as an umbrella term for immediate and delayed echolalia, as well as other unconventional vocal behaviors. But, others apply the term vocal stereotypy to describe the repetition of songs, delayed echolalia, and narrative fragments from previously viewed media. Still others have defined vocal stereotypy as whining, laughing, noises, and other bodily sounds (Stiegler, 2015). In essence, there is immense discrepancy between definitions, causing a barrier in furthering research and intervention in repetitive speech.

Differing fields. Different fields approach repetitive speech differently. The education field tends to come from an ABA stand point. From this perspective, repetitive speech is presumed to hinder academic development and higher-level thinking, and therefore should be eliminated and replaced with more productive utterances (Huppe, 2008). In the psychology field, repetitive speech is viewed as being harmful to social interactions and one's ability to make friends (Paul et al., 2005).

Conversely, in the field of speech-language pathology, repetitive speech is traditionally seen as a way to enable individuals with ASD to maintain social interaction as a compensatory strategy. These strategies are often used when the conversation is beyond their level of understanding (Rydell & Mirenda, 1994). Additionally, discouraging repetitive speech may result in discouraging speech altogether, especially if repetitive productions are an individual with ASD's only means of speech (Taylor et al., 2005). As speech-language pathologists approach intervention, any attempt to produce language is preferred over no speech at all.

Because each individual with ASD is unique, it is difficult to identify the motivation behind repetitive productions, and ultimately to determine whether to applaud or discourage this peculiar form of language. An individual may have a repertoire of specific repetitive utterances

or a specific form, depending on their communicative style. Many of these functions are shown to have communicative intent or cognitive function, but it is not always obvious. Every child with ASD has their individualized process of thought. If the utterance is unrelated to the context, it is not possible to know if the utterance is meaningful or echoed; it may only be known to familiar people in their environment (Stiegler, 2015).

Prizant and Rydell concluded that immediate echolalia served a role to express situational associations, fulfill one's part in verbal exchange, label objects, relay information, and request an object (Prizant & Rydell, 1984). Some functions of delayed echolalia identified by Prizant and Duchan included automatic responses, rehearsal (thinking out loud), self-regulation, "yes" as an answer, and requesting (Prizant & Duchan, 1981). Or, delayed echolalia may be used when the individual may not know how to respond, or may not have the means to respond with the language they have learned. Hence, the child relies on what language they do have, and that is ultimately, repetitive speech (Huppe, 2008). Based on the evidence of function and intent, and the child's ability to communicate, repetitive speech may be beneficial as a bridge to producing naturalistic speech (Stiegler, 2015).

Repetitive speech serves as a necessary stage of the developing linguistic and cognitive system of verbal children with ASD (Prizant & Duchan, 1981). But, inconsistencies in stances across professions have contributed to the lack of agreement in how best to approach repetitive speech in language intervention for children with ASD. A better understanding of what types of situations prompt a child with ASD to depend on repetitive speech would aid in the development of interventions across all fields.

Modification and Encouragement

The language children with ASD know and understand plays a role in how they use repetitive speech, making it essential for clinicians to know how to modify these productions into more spontaneous, generative speech. Communicative partners, context, and methods of intervention, are all ways to shape repetitive speech (Fay, 1975; Foxx et al., 1988; Hetzroni & Tannous, 2004; Huppe, 2008; Prizant et al., 2003; Rydell & Mirenda, 1991; Rydell & Mirenda, 1994).

Role of the communicative partner. The structure of prompts by a communicative partner influences repetitive utterances. Two studies were conducted on the influence of high and low constraint utterances on repetitive productions (Rydell & Mirenda, 1991; 1994). High constraint utterances, also known as structured probes, included wh-questions, commands, and verbal prompts, or cues. Low constraint utterances, or unstructured probes, consisted of comments, “yes” responses, and reflective questions. In the first study administered, more repetitive productions were produced following high constraint (i.e., more-structured) utterances (Rydell & Mirenda, 1991). In the second study, 74% of immediate echolalia was followed by high constraint utterances, and 63% of delayed echolalia was followed by low constraints. These results demonstrate that the communicative style of the communicative partner directly influences not only the frequency of repetitive speech, but also the type produced by the children with ASD. Clinicians need to keep in mind what form of structure they are providing when interacting with children with ASD. (Rydell & Mirenda, 1994).

Foxx also examined how the communicative partner influences repetitive speech use by investigating the effects of feedback. This study explored if therapy could result in a decrease of repetitive productions and an increase of “correct”, or taught, responses to various prompts

(cues). The clinician progressively reduced the feedback and reinforcements given during intervention. This became a positive form of encouragement because intervention gradually became less structured, giving the client more room to produce the appropriate utterance. Once the appropriate response was learned, the cue of presenting an object was removed, testing the child's ability to respond in a less-structured context. This confirms that manipulating one's communicative feedback, such as adding encouragement, can influence an individual's repetitive speech (Foxx et al., 1988).

The types of questions produced by the communicative partner also effect repetitive productions (Fay, 1975). For example, locative and nominal questions influence repetitive speech the most, which both contain unstructured probes. Locative questions ask about locations in certain situations, such as, "Where do you sleep?" Fay believes this kind of question causes more repetitive productions because wh-questions require a higher level of thinking, so either the child does not yet understand the concept, or gets frustrated with the difficulty. As a result, the child relies on repetitive responses to fulfill his responsibility in the conversation. Similarly, nominal questions such as, "What is that?" do not provide any guidance on how to answer. It is an unstructured probe, and therefore, the child is going to fall back on how he knows to respond, with repetitive speech (Fay, 1975). In sum, the level of support the communicative partner offers through questions, prompts, or responses influences whether or not the child with ASD will produce repetitive speech.

Intervention approaches. As with types of communicative partner prompts and feedback, the influence of the amount of structure in interventions has also been explored. Taking a more structured approach to intervention, Hetzroni created a child-friendly interactive computer software designed to reduce the amount of repetitive productions. The software guided

the children through daily activities (e.g., play, food, and hygiene) with questions. This structured intervention decreased the amount of repetitive productions, as well as increased spontaneous speech. The criticism to this form of intervention is that it relied on the use of a computer rather than books or play; this software and form of technology are not accessible to all clinicians or families. Also, without knowing how often the children will be around computers during their daily routines, there is a concern that the reduction in repetitive speech will not generalize outside of intervention. Children are more often around books and play-based activities, so they have a greater chance of applying their language strategies in similar situations (Hetzroni & Tannous, 2004). But, this study lends support to the use of more-structured interventions as a means of reducing repetitive speech use in children with ASD.

Another structured form of intervention is the commonly known therapy for ASD, Applied Behavioral Analysis (ABA). This style of therapy relies heavily on numerous repetitions and reinforcers, with a systematic structure (Huppe, 2008). Huppe's (2008) study focused explicitly on repetitive speech by replacing previously produced repetitive utterances with "I don't know" in response to a question. Once a percentage of appropriate responses were produced within a task, the child moved on to a more difficult task. This highly-structured approach successfully reduced repetitive productions, but did not increase spontaneous speech.

Prizant and Wetherby developed a more naturalistic approach to intervention, entitled the SCERTS Model, which stands for its three areas of clinical focus: Social Communication, Emotional Regulation, and Transactional Support. This model implements goals in each category, based on the level of the individual's language. This approach encourages clinicians to teach individuals how to break down repetitive utterances into segments and then build them back up with a learned meaning. This method promotes understanding of semantic relationships,

functional variety, and spontaneous speech (Prizant et al., 2003). However, there are no studies (to date) that have shown the influence of the SCERTS approach on repetitive speech use in children with ASD.

The Questions of Context

The purpose of this exploratory study is to determine if the degree of structure of the language task, or context, influences the frequency and type of repetitive speech in children with ASD. Studies have shown the structure of communicative partners' questions and feedback and the structure of interventions influences repetitive speech use, but the comparison of tasks has not yet been explored. To investigate the influence of language context on repetitive speech, this study will look at repetitive speech use during previously collected language samples of children with ASD interacting in more-structured and less-structured language tasks.

Method

Participants

To research the influence of the language production task on repetitive speech, four participants (all males) were selected from a larger ongoing research study investigating the impact of repetitive speech on word learning skills in children with ASD. In the current study, all of the participants had an official medical diagnosis of ASD, and were rated as demonstrating either “moderate” or “severe” levels of autism-related social impairment based on the Social Responsiveness Scale- 2nd Edition (SRS; (Constantino, 2012), a parent based questionnaire. All participants were male, as ASD affects around 4.5 times more males than females in the general population (Center for Disease Control and Prevention, 2016), and were native English speakers. All participants passed an oral mechanism examination (Robbins & Klee, 1987) and passed a hearing screening. To be selected from the larger pool of research participants, the children in the

current study also had to achieve standardized scores within the typical range on a nonverbal IQ test (either the Test of Nonverbal Intelligence Third Edition (TONI-3); Brown, Sherbenou, & Johnsen, 1997, or the Test of Nonverbal Intelligence Fourth Edition (TONI-4); Brown, Sherbenou, & Johnsen, 2010), the Expressive Vocabulary Test Second Edition (EVT-2; Williams, 2007), and the Peabody Picture Vocabulary Test Fourth Edition (PPVT-4; Dunn & Dunn, 2007). All participants used natural speech as their primary means of communication and no assistive communication devices were used during any language sampling procedures. All participants showed use of repetitive speech according to parent report. All recruitment and experimental procedures were implemented as approved by the Northern Illinois University Institutional Review Board.

Following these inclusion criteria, four children were chosen for analysis in the current study. EA2 was 6 years, nine months old at the time of the study and his parent reported his racial status as African American. He was mainstreamed in an elementary school in DuPage County of Illinois (Midwestern United States). To confirm his medical diagnosis, the Autism Diagnostic Observation Schedule Second Edition (ADOS-2; Lord et al., 2012) was administered by a trained clinician, and his score met the cutoffs for a classification of “Autism.” He achieved a standard score of 114 for his expressive vocabulary use, a 112 for receptive vocabulary, and a 106 for nonverbal IQ.

EA5 was 11 years, nine months old and his parent reported his racial status as Caucasian. He attended a school for children with autism in DeKalb County of Illinois. His ADOS-2 score met the cut off for a classification of “Autism Spectrum.” He achieved a standard score of 86 for his expressive vocabulary use, a 93 for receptive vocabulary, and a 110 for nonverbal IQ.

EA 9 was seven years, ten months old and his parent reported his racial status as Caucasian. He was mainstreamed in an elementary school in Sangamon County of Illinois. His ADOS-2 score met the cut off for a classification of “Autism Spectrum,” and received a standard score of 120 for his expressive vocabulary use, a 116 for receptive vocabulary, and a 112 for nonverbal IQ.

EA11 was 9 years, nine months old at the time of the study and his parent reported his racial status as Caucasian. He was homeschooled in DeKalb County of Illinois. His ADOS-2 score met the cut off for a classification of “Autism Spectrum,” and he received a standard score of 100 for his expressive vocabulary use, a 96 for receptive vocabulary, and a 99 for nonverbal IQ.

Procedure

The use of repetitive speech was compared in two different language production tasks, 1) storytelling language tasks extracted from the ADOS-2 administrations (more-structured context), and 2) a spontaneous, play-based language sample (less-structured context). All participants had the same male clinician during all language sampling tasks, with the exception of EA2 during the storytelling task and EA9 and EA11 for the play-based task. These secondary female clinicians were also familiar to all of the participants and often were present during the other language sampling tasks administered by the male clinician. All language samples were digitally recorded by a handheld Sony DCR-HC62 video camera mounted on a tripod in the research laboratory, with the exception of one ADOS-2 administration, which used a ceiling mounted recording system in the speech-language-hearing clinic in the same building as the research laboratory. Backup audio was also recorded using a Marantz PMD661 MKII digital recorder and a Shure MX391/0 microphone. However, the audio from the video recordings was

sufficient for all transcriptions, and the audio-only recordings were not used for later transcriptions or analysis.

Storytelling language samples. The first language sample conducted consists of two tasks administered during their ADOS-2 testing, the “Telling a Story from a Book” and the “Cartoon” tasks. These two tasks were completed in the middle of the overall ADOS-2 test to allow time for social rapport to build. According to the ADOS-2 administration manual, the purpose of the story book task is to capture spontaneous speech in a structured setting, as well as what interests the child. It assesses one’s ability to respond to conventional humor and characters’ feelings, as well as whether continuity of a story can be established. The purpose of the cartoon task is to observe gesture in coordination with speech, and if there once again is a response to humor (Lord et al., 2012). Additionally, the ADOS-2 administrator is instructed to note if the child retells the cartoon verbatim, or if it is modified for the purpose of telling a story to a communicative partner.

In the current study, these tasks were selected from the ADOS-2 because they are highly structured language tasks. Looking at and discussing storybooks and cartoons with another person is still an everyday, familiar task for a child, providing a similarly naturalistic language-production task to the play-based sample. The combined duration of these two storytelling tasks for each child averaged 7.5 minutes, and ranged from 5.5 to 10.25 minutes.

Play-based language samples. To elicit a play-based, less-structured spontaneous language sample, each child was provided with a Playmobil farm set with various animals and figures. Each child was asked to play with the toys using his imagination however he liked, and the clinician played along. The clinicians were instructed to play with each child for at least 15

minutes. The average language sample duration was 17.25 minutes, and the range was 15.5 to 20.5 minutes.

Language sample orthographic transcription. For the language sample transcription process, all videos were viewed on a Dell desktop computer with Panasonic over-the-ear headphones in the research laboratory. Then each sample was orthographically transcribed into Microsoft Word by the author and then later assessed for inter-reliability by the author's faculty advisor.

Inter-rater reliability of transcriptions. Utterance by utterance reliability was conducted on three of the four participants. The selection of 75% of all language samples for inter-rater reliability calculations exceeds the minimum amount of 20-30% of all samples recommended by Schlosser (2007). Of these, the inter-rater reliability ranged from 91.36% to 98%, with an average of 94.89%. These calculations were determined before consensus building, and then the finalized utterances agreed upon after the consensus building process were used for final analysis.

Language sample coding. After the language samples were transcribed, they were reviewed again to be coded. To develop operationalized definitions of repetitive speech, existing definitions within repetitive speech literature were reviewed and re-examined. The term repetitive speech was used as an umbrella term for both echolalia and stereotypical speech. Defining immediate and delayed echolalia primarily reflected the research completed by Prizant (1984), Rydell and Mirenda (1994), Stiegler (2015), and Van Santen (2013). Immediate echolalia pertained to a child's repetition of an utterance made by the communicative partner or by the child within two conversational turns of the initial utterance. Delayed echolalia also consisted of a child's repetition of an utterance made by the communicative partner or by the child; but, it

must have occurred after two conversational turns of the initial utterance, yet within the original conversation (Stiegler, 2015; Rydell & Mirenda, 1994).

The term verbal stereotypy applied to a child's use of repetitive, overly "formulaic in nature" utterances with a "consistent intonation pattern" (Lord et al., 2012, p.12). These words or phrases could be intended meaningfully and could be appropriate to conversation at some level. Verbal stereotypies did not include imitative productions made by the communicative partner within the same language sample, which would have been coded as either immediate or delayed echolalia. Verbal stereotypy reflects a repeating of one's own speech or speech from another medium, rather than echoing what is heard within the current conversation. Utterances classified as verbal stereotypies may also have included phrases from books, movies, or other linguistic input to the child (Taylor et al., 2005).

Vocal stereotypy included a child's use of repetitive utterances with a "consistent intonation pattern" (Lord et al., 2012, p.12), but did not include intelligible, non-contextual, and/or non-functional vocalizations (Taylor et al., 2005). Examples of vocal stereotypy included laughs, grunts, and non-linguistic speech (Stiegler, 2015). Based on previous intervention-driven research, verbal stereotypy and vocal stereotypy were considered separate codes because verbal stereotypic speech could later be broken down into meaning and built into functional communication, whereas the latter could not. Additionally, verbal stereotypic speech often may be used communicatively, whereas vocal stereotypy might only serve a self-directive, or no function at all (Prizant & Rydell, 1984).

Inter-rater reliability of coding. After initial coding was completed, the samples were then compared for inter-rater reliability. Inter-rater reliability was calculated in two different ways, 1) utterance by utterance agreement on whether or not a repetitive production occurred,

and 2) on the coded type of repetitive production. For the utterance by utterance reliability, 75% of all language samples were once again completed for agreement. This ranged from 96% to 100%, with an average of 99.1%. The selected code reliability ranged from 80% to 100%, with an average of 95%. Once inter-rater reliability was calculated, then consensus building took place prior to the planned statistical analyses for language sample comparisons.

Statistical Analyses

The general language sample transcription information (e.g., total number of utterances and duration of sample) is summarized in Table 1 for both language tasks for all participants. The play-based samples predominately contained more utterances and were longer in duration than the storytelling samples. To check that there were no inherent differences between the two language sampling tasks in the amount of utterances produced over time, the rates of utterances produced in each sample were calculated by taking the total number of spoken utterances divided by the total number of minutes in a sample for each participant. The mean and standard deviation for these were then calculated for comparison, and no obvious differences between the rate of utterances produced in the storytelling ($M = 6.65$, $SD = 1.05$) versus the play-based ($M = 7.67$, $SD = 2.03$) samples were found (see Table 1; Figure 1).

All coded language samples were entered into the Systematic Analysis of Language Transcriptions (SALT; Miller & Iglesias, 2010) software for analysis. The amount of occurrences of each type of repetitive speech in each language task were calculated. Then, data were analyzed using visual inspection of descriptive statistics for both the frequency and type of the observed repetitive speech.

The frequency of repetitive speech was analyzed in two ways, first by calculating the overall proportion of repetitive speech (i.e., the number of repetitive utterances/number of total

utterances), and second by calculating the rate of repetitive speech (i.e., the number of repetitive utterances/total duration of sample in minutes). The types of repetitive speech produced were analyzed (e.g., immediate echolalia, delayed echolalia, verbal stereotypy, or vocal stereotypy), and the sum across participants for each code of repetitive speech in both language tasks was measured. The means and standard deviations were calculated for both the proportion and rate of repetitive speech exhibited in each task (see Table 2).

Results

The purpose of this study was to determine if the degree of structure of the language task influences the amount and type of repetitive speech produced by children with ASD. Four participants engaged in a more-structured, storytelling task and a less-structured, interactive play task. Then the frequency and type of repetitive speech was compared to explore any potential differences in repetitive speech use in each language task.

Frequency of repetitive speech across tasks. On both measures of frequency, the proportion and rate of repetitive speech, three out of four participants produced less repetitive speech in the storytelling task (M of Proportion = 2.21, SD = 3.28; M of Rate = 15.23, SD = 23.09) than in the play-based task (M of Proportion = 8.38, SD = 12.47; M of Rate = 17.82, SD = 8.86; see Table 2). In fact, two of the participants didn't display any repetitive speech in the storytelling task. Wide variability did exist between the participants; some participants had three or four repetitive productions in the play-based task and one participant exhibited twenty-seven.

Types of repetitive speech across tasks. In the storytelling task (see Table 3), two out of the four participants displayed immediate echolalia. Of these, one of the children also displayed verbal and vocal stereotypies. None of the children exhibited delayed echolalia. Two participants did not display any form of repetitive speech in the storytelling task.

In the play-based task (see Table 4), all four participants demonstrated at least one type of repetitive speech. Every child exhibited immediate echolalia, and one participant used verbal and vocal stereotypies in addition. As in the storytelling task, none of the children exhibited delayed echolalia in the play-based task.

Discussion

The goal of this study was to determine if the level of structure of the language task influenced the amount and type of repetitive speech produced by children with ASD. The findings indicated that children with ASD produced lower rates and smaller relative proportions of repetitive speech during a more-structured, storytelling language task, than in a less-structured, play-based language task. The results further indicated that there were no notable differences across the two tasks on the type of repetitive speech the children with ASD produced; all participants exhibited various types of echolalia and stereotypies in the more- and less-structured tasks. Before exploring these findings further, a few limitations should be considered.

Limitations

Small sample size. This study included four participants, which is a small sample size to generalize to the heterogenous population of children with ASD. But, many studies researching repetitive speech have also had small sample sizes because of the time-consuming nature of transcribing and coding language samples to analyze repetitive speech. For example, Prizant and Rydell's (1984) study investigating delayed echolalia only included 3 children with ASD, and Prizant and Duchan explored immediate echolalia with 4 children with ASD (Prizant & Duchan, 1981). In Rydell and Mirenda's (1994) research comparing the effects of high and low constraint utterances on echolalia, only 7 children with ASD were included. With small sample sizes, these researchers still found significant results. This demonstrates that the current study's small sample

size is consistent within the broader repetitive speech literature. One notable study by Van Santen and colleagues (2013) stands out by analyzing the repetitive speech of 50 children with ASD; however, this was achieved through the assistance of Google to create an analytical software that automatically coded repetitive speech. In the future, research should aim to assess the influence of the language task using this automated software to track repetitive speech in a larger sample of children with ASD. However, because stereotypic speech requires the adherence of a consistent prosodic pattern (Paul et al., 2005), this type of repetitive speech would still need to be conducted by humans, as this perceptual feature remains undetectable by software at this time. Additionally, this study should be replicated with a larger sample size to better accommodate the influence of such wide variability in the repetitive speech use in children with ASD on statistical analyses.

Duration discrepancies between samples. In the current study, the average length of time for the play-based task exceeded the storytelling task by approximately ten minutes. It would have been preferred that the storytelling tasks better adhered to the standard recommendation of collecting language samples with a minimum of 100 utterances and/or 15 minutes in length (Leadholm & Miller, 1992). When the author reviewed the play-based language samples a second time, she observed that more repetitive speech productions occurred in the latter half of the sample than in the first. To help account for the difference in length, the author calculated the rate of total utterances produced per minute in each task, and then derived the means and standard deviations to determine whether the rates of the two tasks differed. Based on these descriptive statistics, the range in rate of speech across the two tasks overlapped, indicating that the difference between the two tasks is likely not significant. After controlling for the rates of total utterances, the author explored the repetitive speech utterances more

specifically. As an additional measure to account for the differences in duration between the two language tasks, the author used the proportions and rates of repetitive speech in each sample, rather than raw counts of utterances containing repetitive speech, for all comparisons. For future research, additional storytelling tasks should be added to reach the minimum recommendations described by Leadholm and Miller (1992).

Naturalistic approach. Although this study used the defining terms more-structured and less-structured for the selected tasks, it should be highlighted that they are both naturalistic tasks that a child would experience in his or her everyday life. The storytelling task still gave the participants freedom to guide the story as they wished, and the flexibility to produce whatever language or speech they wanted. This decision to only include naturalistic tasks, rather than the more socially artificial, drill-based tasks (Foxy, Faw, McMorrow, Kyle, & Bittle, 1988; Huppe, 2008), or self-led computer based therapy (Hetzroni & Tannous, 2004) implemented in previous work, may have limited the extent of difference in outcomes in the current study. In other words, if this study had compared a drill-based task to a naturalistic play-based task, more obviously identifiable differences in the production of repetitive speech may have emerged. Despite these limitations, the current study still identified observable differences based on the language task. The benefit of limiting the current study to only naturalistic tasks is that the tasks are more likely to reflect the repetitive speech the children exhibit in their everyday lives than in a highly-structured, drill-based task. With these limitations in mind, the findings can be explored further.

Context Influences Use of Repetitive Speech

The findings of this study indicated that children with ASD produced lower rates and smaller relative proportions of repetitive speech during the more-structured task than the less-structured task. But, the two tasks did not necessarily impact type of repetitive speech. All

participants displayed various types of repetitive productions in the more- and less-structured tasks.

Repetitive speech use differed between tasks. Three out of the four children produced more repetitive speech in the less-structured, play-based task than the more-structured, storytelling task. One possible explanation for the more frequent use of repetitive speech during the less-structured play-based tasks could be because the children relied on repetitive speech as a compensatory strategy. As posited by Rydell and Mirenda, children with ASD use “echolalia as a compensatory strategy to more efficiently manage the social, cognitive and linguistic demands placed upon them” (1994, p. 731). It is possible that the nature of the play-based task increased the social burdens to the point where the children depended more on repetitive speech to maintain the conversational demands than what they would have needed to succeed in a more-structured task. With this in mind, the author again reviewed the language sample of the one participant who had more repetitive speech in the more-structured, storytelling task and observed that he was distracted because of his uncomfortable clothing. Therefore, it is possible that he produced more repetitive speech during this task as a compensatory strategy because he could not devote his attention toward language processing and producing more spontaneous language at that time.

Fay (1975) found similar results relevant to the structure of context presented to the child. He concluded that children respond differently to varying question types. More echolalic utterances occurred in response to questions regarding location, perhaps because it requires the child to generate an answer without any sense of context or structure. Echolalic utterances also followed nominal questions because the lack of structure likely required difficult cognitive/linguistic demands. These findings are consistent with the current study’s results in

that the less-structured questions, as with the less-structured language task, led to the use of more repetitive utterances.

Although not a direct comparison, Rydell and Mirenda (1991)'s study most similarly aligns with the current study's goal to explore the influence of the language task on repetitive speech use, but found differing results. This study divided naturalistic play interactions into a "directive" style (more-structured) and a "facilitative" style (less-structured). The "directive" style included directives (instructions), high constraint questions (wh- and yes/no) and control of the focus and topic of the conversation. In comparison, the "facilitative" style included low constraint utterances, such as reflective questions open for a broad range of answers and conversational turns to keep the conversation flowing. Additionally, the child chose the topic of conversation. The researchers discovered the children produced more echolalic utterances following high constraint questions and directives than low constraint questions and comments. This finding differs from the current study's finding that more repetitive speech was produced in the less-structured tasks.

A possible explanation for the conflicting results could be because the studies differed in how the researchers manipulated the structure of the language context. In the Rydell and Mirenda study, the focus was on the structure of the semantic and syntactic skills needed to succeed on the language task, whereas the current study focused more on the pragmatic, social structure demands of the language task. For example, the storytelling task had clear social expectations of describing the events depicted in the pictures on the book pages to a communicative partner. But, in the play-based task, these supports were not available, leaving the children to rely on repetitive speech as a compensatory strategy to successfully engage in and sustain the social exchanges during interactive play.

To explore this potential reliance on repetitive speech as a compensatory strategy during the play-based task, two factors should be considered. First, the storytelling task was recorded prior to the play-based task. Second, the author noticed that the majority of the repetitive speech utterances occurred in the latter half of the play-based task. It is possible the children gradually exhausted their social language tools over the course of their participation in the larger study, and began to rely on their compensatory strategy (i.e., repetitive speech) as a means to continue meeting social demands with the clinicians implementing the language tasks. It is worth repeating that all of the participants in this study had normal nonverbal IQ, receptive and expressive vocabulary, and spontaneous speech. Consistent with an ASD diagnosis, the primary area of weakness is social functioning, as reflected in the participants' SRS-2 ratings in the moderately or severely impacted range. Prizant and Rydell (1984) and Prizant and Duchan's (1981) studies discovered that several of the underlying functions for echolalia use are socially related, such as turn-taking, labeling, and requesting. This interpretation is consistent with the current study's findings.

Types of repetitive speech are similar between tasks. Based on the findings of the current study, the structure of the language task did not influence the type of repetitive speech the child produces. This differs slightly with previous work by Rydell and Mirenda (1984), who found that more immediate echolalia followed high constraint utterances, and delayed echolalia followed low constraint utterances. In the current study, immediate echolalia was most commonly used across participants in both tasks, and no participants displayed any delayed echolalia. The differences between these studies likely lie in the purposes underlying the use of repetitive speech, rather than in the degree of structure. Prizant and Duchan (1981) suggested that immediate echolalia may be more common because of the multiple functions it serves, and

that there is evident comprehension behind the production of the repetitive utterances. Many of the functions behind echolalia overlap in both immediate and delayed echolalia (Prizant & Duchan, 1981; Prizant & Rydell, 1984). The repetitive speech used by the participants in the current study exhibited the function of declaration, or labeling. For example, the clinician stated, “And this one is a cartoon.” In response to this low-constraint statement, the child said, “cartoon.” Another common function was rehearsal, which can be thought of as thinking out loud. As a participant was focused on the object he was playing with, he repeated a thought to himself, “how odd.” Perhaps because the clinicians were not restricted in their use of low- versus high-constraint utterances, the functions behind each type of repetitive speech varied widely, and may have led to the differences in outcomes between these two studies.

It is also possible the chosen definitions for this study played a role in these findings. In this study, the author coded immediate echolalia, delayed echolalia, verbal stereotypy, and vocal stereotypy as different types of repetitive speech after examining existing definitions in the literature (Lord et al., 2012; Prizant & Rydell, 1984; Rydell & Mirenda, 1994; Stiegler, 2015; Taylor, Hoch, & Weissman, 2005). If the definitions differed, such as collapsing the verbal and vocal stereotypy codes, results may have varied (Prizant & Rydell, 1984; Stiegler, 2015; Taylor et al., 2005).

Clinical Implications

Based on these exploratory results, practicing clinicians who strive to provide language contexts that reduce the amount of a child’s repetitive speech would benefit from implementing more supportive, structured language tasks, such as describing stories in books, rather than less-structured, play-based tasks. Also, the tasks should still be naturalistic so that progress in intervention is more likely to generalize into one’s daily life (Delprato, 2001). Prizant and

Duchan (1981) stated that routines taught in a natural context allow the child to “realize the full impact of the use of language and thus increase generalization of acquired structures” (p. 248). Having more naturalistic tasks is valuable because it is shown to generalize more so than ABA therapy (Foxy et al., 1988; Huppe, 2008). One example of a more naturalistic approach for working with children with ASD is the SCERTS model, which allows “for greater creativity in language production, and movement to more conventional forms” of speech, rather than repetitive speech (Prizant et al., 2003). In this intervention approach, the clinician assists the child in breaking down repetitive utterances, and then building them back up with the correct meaning in order to produce spontaneous language. Clinicians can take advantage of this semi-structured, yet still naturalistic learning process and shape repetitive speech.

Children with ASD who display repetitive speech are looked at differently in society, which impacts their educational and vocational careers (Paul et al., 2005). By understanding what language tasks influence repetitive speech use, clinicians can work towards shaping that speech into more productive communication, improving one’s quality of life. As stated by Prizant and Duchan, “Success in communication would motivate the autistic child to want to learn language, initiate interaction with others, and become an active member of the world around him” (1981, p. 248).

Conclusions

Repetitive speech is a highly prevalent feature of Autism Spectrum Disorder (ASD), and occurs at a greater frequency than typically developing children and children with other disabilities (Lanovaz & Sladeczek, 2012; MacDonald et al., 2007; Shield et al., 2017; Schuler, 1979; Stiegler, 2015; Van Santen et al., 2013). There is a lack of research to assist clinical professionals in understanding the causes and appropriate interventions for repetitive speech in

children with ASD. Knowing how the structure of the language context influences repetitive productions has major implications for enhancing one's quality of life. Practicing clinicians would benefit from implementing more-structured naturalistic tasks, such as storytelling, to reduce the child with ASD's reliance on repetitive speech. To confirm these recommendations, future research should include a larger sample size, longer durations of language samples, and more variety in the structure of language tasks. Moving forward will allow practicing clinicians to target productive communication in intervention with children with ASD.

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Table 1

Transcription Information for all Participants

	Number of Utterances		Duration of Sample		Rate of Utterances in Sample		
	Storytelling	Play-based	Storytelling	Play-based	Storytelling	Play-based	
EA2	72	217	10:16	20:26	7.02	10.59	
EA5	32	121	6:02	16:54	5.33	7.12	
EA9	53	110	8:15	15:25	6.42	7.1	
EA11	43	100	5:32	16:59	7.82	5.88	
Total	200	548	30:05	1:09:04	Mean (SD)	6.65 (1.05)	7.67 (2.03)

Table 2

Proportion and Rate of Repetitive Speech

	<u>Storytelling</u>		<u>Play-based</u>	
	<u>Proportion</u>	<u>Rate</u>	<u>Proportion</u>	<u>Rate</u>
EA2	6.94	48.78	0.50	4.87
EA5	0.00	0.00	3.30	23.53
EA9	1.89	12.12	2.72	19.35
EA11	0.00	0.00	27.00	23.53
Mean	2.21	15.23	8.38	17.82
SD	(3.28)	(23.09)	(12.47)	(8.86)

Table 3

Storytelling Task Codes

	<u>Immediate Echolalia</u>	<u>Delayed Echolalia</u>	<u>Verbal Stereotypy</u>	<u>Vocal Stereotypy</u>	<u>Total</u>
EA2	2	0	1	2	5
EA5	0	0	0	0	0
EA9	1	0	0	0	1
EA11	0	0	0	0	0
Total	3	0	1	2	6

Table 4

Play-based Task Codes

	<u>Immediate Echolalia</u>	<u>Delayed Echolalia</u>	<u>Verbal Stereotypy</u>	<u>Vocal Stereotypy</u>	<u>Total</u>
EA2	1	0	0	0	1
EA5	4	0	0	0	4
EA9	3	0	0	0	3
EA11	2	0	19	6	27
Total	10	0	19	6	35

Figure 1

Rate of All Utterances/Minute

