Use of lag schedules to increase play variability across settings for a preschool child with Autism.

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Abstract

The importance of play is becoming increasingly evident in the holistic development of young children. Play develops effortlessly in typically developing children, but in children with autism spectrum disorder (ASD), play needs to be taught explicitly. Children with autism have limited play variability and often display rigid and repetitive play behaviours, which negatively impact their social functioning and language development. Play in autism is a really important target behaviour. Teaching play can improve exposure to learning opportunities, social interactions and increase access to reinforcement, which in turn will improve language acquisition and communication skills. The primary objective of this study was to determine how lag schedules of reinforcement can increase the play variability of a boy, aged three, with limited play and social skills. A multiple probe design with a changing criterion design was used across three different play settings: wooden figurine and a doll's house, water play and a fire station play set. Results showed that lag schedules were sufficient to increase the play variability for the participant across all three settings. Generalisation was seen to occur during normal play sessions across various play settings in the early childhood centre, with increases in peer interaction. The current study provides empirical evidence that supports the use of lag schedule of reinforcement to increase the average play variability in children with ASD.

Keywords: autism, lag schedules, language, play, social skills, variability

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Ethical considerations

The Human Research Ethics Committee of the University of Waikato granted formal approval for this research. Written consent was given by the father of the child for their participation in the research.

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Introduction

There are many theories on the subject of play that often outline the stages of children's play development. Some of the more well-known theorists on this subject are Sigmond Freud, Eric Erikson, Vygotsky, Bronfenbrenner, Piaget and Parton. Play allows children to explore the world. Through this process, language, cognitive and social skills development enable them to contribute to and engage with their environment (Barton & Wolery, 2010; Baruni et al., 2014; Hanley et al., 2009; Kasari et al., 2006; Lang et al., 2014; Lifter et al., 2005; Lifter et al., 1993; Parten, 1932; Piaget, 1962). Play develops naturally in typically developing children, but delays in the development of play are frequently reported in children with autism spectrum disorder (Autism Speaks, n.d.; Charlop et al., 2018; Jordan, 2003; Lang et al., 2014; Lang et al., 2020; Lifter, Mason, et al., 2011). Autism spectrum disorder (ASD) is a widespread developmental disorder, and it is estimated that around one in 100 New Zealanders are affected by it (New Zealand Ministry of Health, 2020). Children with ASD will often demonstrate stereotypical and rigid behaviours in toy play (American Psychiatric Association, 2013) and research revealed that they exhibited less variability in play (Frith, 1972). Opportunities for social interactions are reduced when play is not well developed and that deficit may negatively influence the development of social skills, language and communication (Barton & Wolery, 2010; Licciardello et al., 2008; Pierce-Jordan & Lifter, 2005). There is a strong relation between play and language development and the hypothesis is that by increasing children's play variability, it might have concomitant benefits on language ability and social development. Skills to reduce the deficit in play can be taught deliberately. Research suggests that lag schedules of reinforcement could be a suitable method for teaching variability and novelty of play. Goetz and Baer (1973) documented an increase in varied play behaviour when the children received social reinforcement contingent on their block building behaviour. Cammilleri and Hanley (2005)

focused on variability in selecting classroom activities and their results showed that both children emitted a clear increase in novel activity choices as well as increased time spent doing educational programmed activities. Lang et al. (2014) conducted a study that provided support for the use of reinforcement schedules as an effective intervention to increase appropriate play behaviours and decrease stereotyped behaviours in children with autism. Sutton (2017) extended the work of Baruni et al. (2014) and the results showed response variation using a lag 5 schedule. A recent study by Tutty (2021) used lag schedules of reinforcement to increase the play variability across three play settings of a seven year old individual diagnosed with Autism and global developmental delay. Results showed an increase in play variability, the number of different play actions and in novel play behaviour. The purpose of the current study is to investigate the effect of lag schedules of reinforcement to increase play, and specifically variability in play for children diagnosed with ASD. The hypothesis is that lag schedules would increase the play variability of a young child with autism.

Literature Review

Importance of play in the development of young children

The importance of play has been extensively examined, theorised, and researched over the years. In society today, a great emphasis is placed on academic goals, economic success, and hard work. The general discernment is that play is frivolous, therefore, the perception arises that children engaging in play are wasting their time and doing something unimportant. However, the New Zealand Early Childhood Curriculum, Te Whāriki, clearly considers play to be a priority in the education of young children. Te Whāriki encapsulates young children's education into five strands: Wellbeing, Belonging, Contribution,

Communication and Exploration (Ministry of Education, 2017). In each of these strands, Te Whāriki has clearly stated goals and learning outcomes which include the importance of providing opportunities for young children to become increasingly capable of "using a range of strategies and skills to play and learn with others" (Ministry of Education, 2017, p. 24). "Play is often associated with pleasure or delight, therefore it is automatically reinforcing" (Kindler, 2009, p. 2). Play allows children to explore the world and through this process, children learn a lot about the world around them. Researchers argue that play is, and ought to be, the main vocation of all children despite the variance among different cultures and individual children. These experiences and interactions with the world differ between children, and the way humans react to changes, vary from person to person. Play is the most important aspect of a developing child's life, providing a foundation for brain development that influences three specific key areas of development i.e. language, cognitive, and social skills (Barton & Wolery, 2010; Baruni et al., 2014; Hanley et al., 2009; Kasari et al., 2006; Lang et al., 2014; Lifter et al., 2005; Lifter et al., 1993; Parten, 1932; Piaget, 1962). When children play, they are actively engaging with their environment and at any time they actively engage in the environment around them they are learning.

Play and cognitive skills

According to Freud, play supports children to self-regulate, grow the division between thought and actions, and expand their skills needed to gain higher cognitive performance (Bodrova & Leong, 2015). A study by Dansky and Silverman (1975) found that children were able to expand on the number of alternate uses of different objects by simply spending time playing with these objects. Dansky and Silverman (1975) had 36 participants aged between three and five years. The objects available in set A were pipe cleaners, clothes pins, paper clips, blank cards, empty matchboxes, small corks, empty wooden spools, and a pair of pliers. The B set had paper towels, a plastic cup, a screwdriver, and a coat hanger. In the

first phase, the play task required participants to be partnered and they were instructed to play with the objects however they desired. For the intellectual task, the participants were instructed to identify an object by the verbal clues given. During the second phase, the participants were asked to verbally provide as many uses as possible for each of the objects by only looking at the objects. The findings showed that the participants in the play condition delivered significantly more uses than the participants in the other two conditions. Dansky and Silverman (1975) concluded that when children play, they systemise their experiences and develop skills involved in the creative process such as coming up with novel ideas in the use of different objects, problem-solving, exploring more advanced play forms, trying different approaches and asking questions to extend their thinking. Holmes et al. (2015) further suggest that skills involved in the creative process such as coming up with novel ideas, the ability to evaluate one's work, and discipline and control, are vital to successfully resolve problems.

Play, social skills and communication

The development of play is closely linked to the development of communication and social skills that enable children to contribute to and engage with their environment. Children acquire skills from birth through play, that ultimately shape and influence the way they interact, make choices, problem solve, relate to others and more. There is a close relation between language abilities and increased social encounters involving verbal communication (McDuffie & Yoder, 2010; Venker et al., 2011; Yoder et al., 2016). Play provides a platform where children have an opportunity to apply their verbal and non-verbal language skills. Lewis (2003) highlighted that language and symbolic play both depend on a symbolic representation, "the ability to let one thing stand for something else" (Lewis, 2003, p. 392).

McCune (1995) found a considerable correlation between the early stages of symbolic play and development of word combinations in children's play. For example, the child would pretend to drink from a toy cup and say, "drink water". The next level of language development, namely multi-word utterances, was closely linked to onset of higher levels of play. McCune (1995) defined different levels of symbolic play such as presymbolic (level one), single pretend acts (level two and three), representational sequences (level four) and hierarchical pretend (level five). This study's findings showed that children who transitioned from one symbolic play level to the next in their play were more likely to reach language milestones such as word combinations and multiword utterances than children who did not transition. McCune (1995) concluded that the findings indicate that early language acquisition seems to be integrated with play development, instead of language being an isolated skill.

Various theories of play development

Strong knowledge and understanding of the development of play are paramount to the goals and objectives of early intervention. It was not until the 20th century that the study in the field of child development became more prominent. Researchers became increasingly interested in the influence play has on the development of the child. There are many theories on this subject that often outline the stages of play development of children, such as manipulating various objects in multiple ways and identifying, thus the typical ages at which growth milestones such as crawling, walking and talking occur. Some of the more well-known theorists are Sigmond Freud, Eric Erikson, Vygotsky, Bronfenbrenner, Piaget and Parton.

Freud was the founder of psychoanalysis and developer of the psychoanalytic theory. This theory studied the role of the unconscious and early childhood experiences on human development. According to Freud, children deal with anxiety-producing events and gain

greater emotional stability through play as well as using play to express themselves. Freud regarded play as cathartic and that it allowed children to express their feelings, thus allowing them to substitute their painful feelings that were caused by traumatic events, with more pleasurable feelings (Saracho & Spodek, 1995).

Expanding on the psychoanalytic theory, Eric Erikson's psychosocial theory, includes the importance of the social environment surrounding the child, as well as the relationships with family and their effect on the child's development. Erikson described children's play episodes as representations of situations in the past, present, and future, that the children reflect on and use to predict and plan future behaviour. According to Erikson, play provides children with the platform to deal with emotional and behavioural problems they face in the real world (Bergen, 2015). Others, such as Lev Vygotsky and Urie Bronfenbrenner, highlighted the role of the context where the following aspects were important influences on the development of children; the people around a child, specifically adults, and the environment and culture they grew up in. Learning happened with more capable others. The capable others were influential in a child's learning, by scaffolding the child from where they were performing, to their full potential. Significant value was placed on peers and the fact that children develop social skills through their interaction with peers (Bodrova & Leong, 2015; Freeman & Kasari, 2013; Lambert, 2000; Saracho & Spodek, 1995; Xu, 2010).

Vygotsky's sociocultural theory of play development emphasised the concept of instructional scaffolding which allows the child to build connections based on social interactions. His Zone of Proximal Development theory (ZPD) describes how children can be taught to play, by a person more proficient (e.g., parent or teacher), who can scaffold the child during play by introducing new concepts slightly above the child's current level of functioning (Bodrova & Leong, 2015).

The bioecological theory of development was formulated by Urie Bronfenbrenner. This framework is used to hypothesise how individual development is influenced by multiple interconnected environmental systems. The four systems Bronfenbrenner highlights in which children are embedded, are the microsystem, mesosystem, exosystem and macrosystem (Cannella-Malone & Sabielny, 2020).

Jean Piaget, the Swiss philosopher and developmental psychologist, acknowledged the importance of play as an essential process in children's intellectual, emotional, social, and physical development (Piaget, 1962). Piaget (1962) focused on cognitive development and not so much on social development, reasoning that children's involvement in a specific type of play correlates directly with their level of cognitive development. As a stage theorist, Piaget identified developmental stages in children's learning and understanding, with different types of play emerging at different ages and stages of development that occur in the same sequence for all children. Piaget focused in detail on what was happening on a cognitive level for the children while they were playing and more specifically what the child might be thinking while they were manipulating the objects they were playing with. Piaget's four stages of play are functional play, constructive play, symbolic/fantasy play, and games with rules. According to Piaget, children are proficient at understanding specific information only at particular stages in development. For example, toddlers are not capable of understanding rules in games and this capability only comes at a later stage.

Smilansky (1968) continued Piaget's work and recognised Piaget's four stages of play that reflect the child's cognitive development; functional, constructive, dramatic or pretend, and games with rules and referred to functional play as basic or repetitive muscle movements with or without objects (Smilansky, 1968).

In disparity with Piaget, Parten (1932) placed emphasis on the social aspects of play rather than on how the child interrelates with the objects in the environment. Parten observed

young children at play and identified six stages of play: The first two non-social stages of unoccupied play and solitary play (birth - two years) starts with a lot of movements with arms, legs, hands, feet, etc. In the first two stages, children are learning about and discovering how their body moves. In the solitary play stage children play alone and are not interested in playing with others yet. During the onlooker/spectator behaviour stage, from age two, children begin to watch other children play but do not quite join in, therefore play is also regarded to consist of non-social activities (Xu, 2010). Parten (1932) described the next stage as parallel play, play that occurs when children play independently alongside or near others but not yet with them. This play stage is more social and observable from around two years and older. The last two stages named associative and cooperative play involve functional social interactions with other children. Associate play is visible in children aged three to four, when children interact with others during play, but still with limited interaction. Play might be related to the others in the vicinity, but interaction with others is limited. For example, children might all be playing in the family play area, but they are all doing different things. The sixth stage of play, cooperative play, is often visible in children ages four and over. Parten (1932) explains that children are playing with others and have an interest in both the activity and the other children involved in the play activity and are working towards a common goal.

Lifter, Mason, et al. (2011) conducted a review on the various taxonomic approaches to classifying and defining play behaviours. The conclusion was that most conceptualisations stress either the appearance (topography) of the play behaviour or the underlying cognitive processes and constructs expected to be required for a specific form of play. Lifter, Mason, et al. (2011) point out that both perspectives have contributed to our understanding of play and to the identification of effective approaches to teaching play. This play theory focuses more on the interaction of the child with the play object and states that young children usually

spend a lot of time playing with toys. Lifter, Foster-Sanda, et al. (2011) describe young children's play as an interaction between the child and the toys they are interested in. The child's attention is focused on the play activity, irrespective of whatever else is going on around them. According to Lifter, Mason, et al. (2011) , manipulative and symbolic play are the two main categories the different play activities can be categorised in.

Autism spectrum disorder (ASD)

Even though each child develops at a slightly different pace, almost everyone has a similar developmental trajectory (Bodrova & Leong, 2015; Cannella-Malone & Sabielny, 2020; Parten, 1932; Piaget, 1962). This includes language and communication, socialising, cognitive skills such as problem solving and physical development; for example, crawling and fine motor skills. For this particular study, children with autism spectrum disorder (ASD) and the improvement of their play will be the main focus. ASD is a widespread developmental disorder, and it is estimated that around one in 100 New Zealanders are affected by it (New Zealand Ministry of Health, 2020) and .97% (approximately one in 103) in 26 high-income countries worldwide (Fombonne et al., 2021). Autism is defined in the International Statistical Classification of Disease and Related Health Problems (ICD) as: "A type of pervasive developmental disorder that is defined by: (a) the presence of abnormal or impaired development that manifests before the age of three years, and (b) the characteristic type of abnormal functioning in all the three areas of psychopathology: reciprocal social interaction, communication, and restricted, stereotyped, repetitive behaviour" (World Health Organization, 2019). ASD often emerges before the age of three years and is a permanent, nonprogressive neurological disorder. Parents of children diagnosed with ASD often report their children's development as typical, including initial evidence of language acquisition, play and social skills up to the age of 18 months. A deterioration of these skills becomes evident over some time. ASD is also a spectrum disorder, where the traits transpire in a wide

variety of combinations, from mild to severe. Interventions and management must be tailored to each child due to the spectrum disorder.

Diagnosis of autism is not based on a medical or genetic test, but only on behavioural observation. There are several diagnostic manuals that professionals and health care providers use as tools to define conditions; such as, The Diagnostic and Statistical Manual of Mental Disorders (DSM-5), released by the American Psychiatric Association and the International Statistical Classification of Disease and Related Health Problems (ICD) (World Health Organization, 2019). The most used diagnostic tools in New Zealand are the ADI-R (Autism Diagnostic Interview-Revised) and ADOS (Autism Diagnostic Observation Schedule), viewed as the 'gold standard' for observational assessment of ASD. ADI-R is a semi-structured interview with demonstrated validity when administered by an experienced clinician. Children with autism will often focus their attention on the objects or other things in their environment, for example, the sounds, movements, lights, or arrangements of things, as opposed to the neurotypical child who will most likely focus on the people in their current environment (American Psychiatric Association, 2013; Autism Speaks, n.d.).

The deficits in behaviour, verbal and non-verbal communication and social skills, including restrictive play in the form of repetitive and invariant behaviour in some children, are common characteristics of this neurodevelopmental disorder (American Psychiatric Association, 2013; Anderson et al., 2004; Baruni et al., 2014; Sutton, 2017; World Health Organization, 2019).

What does play look like for children diagnosed with ASD?

The literature revealed delays across a range of play skills in children diagnosed with ASD compared to typically developed children (Autism Speaks, n.d.; Charlop et al., 2018; Jordan, 2003; Lang et al., 2014; Lang et al., 2020; Lifter, Mason, et al., 2011). The definition for autism (American Psychiatric Association, 2013; World Health Organization, 2019) refers

to repetitive behaviour. This is also true for play behaviour of children with autism, which is often limited to a repetitive play repertoire (Boucher, 1977; Freeman & Kasari, 2013; Frith, 1972; Honey et al., 2007; Lifter et al., 2005). Significant data from various studies on the differences between the play in children with ASD and typically developing children has been collected recently. Children with ASD will often demonstrate stereotypical and rigid behaviours in toy play, and will only manipulate a few objects in a limited number of ways (Bruckner & Yoder, 2007; Tilton & Ottinger, 1964; van Berckelaer-Onnes, 2003). Variety, imitation, pretend play and play organisation are often absent from the play repertoire of children with ASD (Kindler, 2009). Freeman and Kasari (2013) and Kasari et al. (2010) argue that without intervention, reciprocal, symbolic and turn-taking play can be very limited in these children and that they often lack functional and social play. A prominent issue emerging from these findings is the differences in play variability between children with ASD and typically developing children.

Research conducted by Frith (1972) revealed that children with ASD exhibited less variability in play with assorted colour stamps and a xylophone, compared to typically developing children and children with other additional needs. In this experiment, the individuals with autism produced sequences that were more repetitive and patterned, in comparison with the typically developing children and children with other additional needs. There are also similarities between the study by Frith (1972) and the study Boucher (1977) conducted with a single toy car and garage play set, where participants had the option to park the toy car in the different garages. In this study, the participants with autism were less likely to vary play behaviour and use the three different garages available, when compared to typically developing children, who consistently exhibited variability in play actions during these studies.

Outcomes of limited play variability

Behavioural and linguistic variability are fundamental aspects of daily social interactions. The frequent use of rote and invariant responses by an individual (American Psychiatric Association, 2013), as typically observed in children with ASD, may have a negative impact on the quality of that person's social interactions with others and limit contact with social opportunities of reinforcement. Unvarying responses in speech and play of children with autism could partly contribute to the inability to form and sustain new friendships (Autism Speaks, n.d.; Luk et al., 2019). Children with autism could be non-verbal or have delayed language skills and exhibit irregular, very repetitive utterances. They often find it exceedingly difficult to acquire a functional verbal repertoire.

Anderson et al. (2004) concluded in their study of social skills assessment of children with autism in free-play situations, that there is a definitive difference in both play behaviour and social interactions between the group of children with autism and their typically developed peers. Typically developing children learn through play as they explore their environment; social reinforcement supports the development of their social skills (Ministry of Education, 2017). In contrast, children with ASD are not socially orientated. It is not an important aspect of their day-to-day activities. Non-verbal communication, such as eye contact, facial expressions, and body language, as well as verbal communication, are often challenges that impair their social interactions. Unfortunately, opportunities for social interactions are lost when children do not learn to play and that deficit may negatively influence the development of social skills and communication (Barton & Wolery, 2010; Licciardello et al., 2008; Pierce-Jordan & Lifter, 2005).

Hine and Wolery (2016) recognise the importance of the intervention goal of teaching play for children diagnosed with autism. Teaching play to children with ASD reduces the noticeable differences in social skills between neurotypical children and children with autism.

When the visible contrast between children with ASD and others is decreased, the probability that the children with autism will be included in other activities alongside other neurotypical children will increase and providing them with the opportunity to learn alongside their peers. Verbal interaction with other children and adults could also increase, or they might even engage in play if the child with autism engages in actions typically known as play (Hine & Wolery, 2016). Play offers a perfect setting to focus on shortfalls related to autism and early childhood is the perfect stage to apply play skills training (Lang et al., 2014; Lifter, Foster-Sanda, et al., 2011; Lifter, Mason, et al., 2011; Ninci et al., 2013). There is a strong relation between play and language development and the hypothesis is that by increasing children's play variability, it might have concomitant benefits on language ability and social development. Miller and Neuringer (2000) argued that variable behaviour is incompatible with limited, sterile and ritualised behaviours and by increasing play variability, the hypothesis is that stereotyped behaviours will decrease (Lang et al., 2014). Therefore, increasing play variability might be a worthy target behaviour.

Harrison (2020) conducted her study in an early childhood centre, with five typically developing children, aged three. The purpose of this study was to explore play variability in typically developing young children and how to measure variability. Harrison (2020, p. 16) defined a variable play action as "play action that is topographically different to the preceding one". "Novel play actions were defined as those that the individual child had not yet performed in the observation session" (Harrison, 2020, p. 16). Functional play refers to the child using the toys for the purpose it was intended. Novel or variable actions were coded as a novel and/ or variable response. Key findings from this study were that the different toys showed diverse levels of variability and novelty. Most variable play actions were observed with the toy set compared to the single car and outside play. These observation of functional toy play in typically developing preschool children can inform measurement and study design

on variability as this study focused on what variability and novelty looks like and how they can be measured (Harrison, 2020). Research findings from Harrison (2020) could be used in the development of a tool to establish normative data on response variability.

For the purpose of this thesis, variability in play will be defined as any play act that is different to the preceding play action, whereas a novel act is a play action that has not been previously observed.

Behavioural approaches used to increase variability in play in children with ASD

Research on Applied Behaviour Analysis (ABA) interventions in teaching play and improving play variability are limited at present (Lang et al., 2014; Lang et al., 2020; Lang et al., 2009). ABA focuses on behaviour, its function, and the effect of the environment on behaviour in everyday circumstances and is concerned with improving the behaviour of the individual. Play from a behaviour analytic point of view would be described as another behaviour or skill that is learned. Behaviour analysis addresses the skill deficit in play as any other skill deficit. This deficit in play can then be taught deliberately. Some of the interventions that addressed play are discussed below.

Extinction

Lalli et al. (1994) conducted a study with two children aged four and five years with developmental delay and applied social reinforcement to a pretend play behaviour and extinction of previously reinforced play behaviour to increase novel play behaviours. Two single toys, a plane and a doll, were used in this study and the participant did not engage with the toys during baseline. Researchers taught the children specific play behaviour with the doll and the plane and delivered social reinforcement for these play behaviours. Behaviour was placed on extinction after three occurrences of reinforcement. This process was repeated for each novel play behaviour the participants produced within each session. During

extinction, both participants showed an increase in novel play responses across both toys. However, extinction methods have limitations and side effects such as extinction bursts. Extinction bursts are an increase in the frequency or intensity of the target behaviour. Other limitations are resistance to extinction, reappearance of the behaviour, namely recovery, and possible increase in extinction-induced aggression (Cooper et al., 2020; Miller & Neuringer, 2000).

Video modelling

Researchers have had positive outcomes with video modelling to increase both verbal and play actions in play in children with autism (Dupere et al., 2013; Hine & Wolery, 2016; Lydon et al., 2011; MacManus et al., 2015). Video modelling offers children examples of particular play skills and suggests guidelines for suitable play, utilising other people or the child as models (Dupere et al., 2013). Examples of appropriate and new behaviour are recorded and displayed to the participant on a screen. Video modelling can include video clips of appropriate or new behaviour, and repetitive images of the same behaviour or combinations of examples of behaviour (Hine & Wolery, 2016). Stahmer (1995) described video modelling as a promising intervention for children who present with limited reinforcers to use in other behavioural teaching techniques and who originally avoid social interactions with other people. Video modelling could be an effective teaching method for children with autism as it could be manipulated to filter out unrelated elements which may be distracting to the child (Lydon et al., 2011). Hine and Wolery (2016) argue that video modelling necessitates that the individual must attend to the person's actions and must be able to impersonate these actions. Since the individual's response will be restricted to what is instructed in the video, variability within play is not directly targeted. Consequently, to directly target and reinforce play variability and increase response variability, it is probable that additional approaches would be required (Dupere et al., 2013; MacManus et al., 2015).

Use of lag schedules to increase play variability

Lag schedules of reinforcement are a recent development and could be a suitable method for increasing the variability and novelty of play. Typically, during a lag 1 schedule of reinforcement the participant will receive reinforcement if the response is different from the preceding response. A lag 2 schedule, the participant will only receive reinforcement if their response is different from the preceding 2 responses and lag 3 needs 3 preceding responses from the participant, etc.

Goetz and Baer (1973) were among the first researchers to apply studies of response diversity by studying play variability in block building behaviour of 3 neurotypical preschool girls that demonstrated a noticeably invariant repertoire of block-building skills compared to their peers. Goetz and Baer (1973) outlined 20 forms/combinations that participants could construct from a wide variety of blocks. A form diversity (variability) score was defined as the number of the 20 forms appearing at least once in any session's construction(s). A new form (novel) score was defined as the number of these 20 forms appearing in each session's construction that had not appeared in any prior construction by that child (in previous sessions of block building) recorded within the study. The children received social reinforcement contingent on their block building behaviour and Goetz and Baer (1973) documented an increase in varied play behaviour. Thus, reinforcement is a powerful tool that can be used to teach variability.

Cammilleri and Hanley (2005) focused on variability in selecting classroom activities with two neurotypical children by using lag-differential reinforcement schedules. The selection of activities available, included the opportunity to read, play with wooden blocks and computer-based math games. The participants displayed limited variability in the activities available, by only engaging in three or four of the 12 activities available during baseline. Both participants spent the majority of their time playing with the blocks. An

activity selection by the children that differed from all previous selections made in a particular session, was considered novel. No consequences were given for selecting a specific activity during baseline. During the intervention phase the lag schedule of reinforcement gradually increased from 1 to 12, as the sessions progressed, since there were 12 opportunities for activity selection per session. The participants received cards for each novel activity. These cards could be exchanged for two minutes of teacher attention. The results showed that both children emitted a clear increase in novel activity choices as well as increased time spent doing educational programmed activities relative to baseline. This also resulted in an increase in access to a variety of different activities. However, the time the participants spent with the different activities decreased significantly as novel activity selections increased. The reason for this was that the participants switched many times during the session, because the schedule of reinforcement encouraged quick changes in activity selections. Another limitation of this study is that Cammilleri and Hanley (2005) did not investigate maintenance of the toy play.

Lang et al. (2014) conducted a study to increase the appropriate play behaviours of children diagnosed with autism. Participants were three children between the age of two and six years of age, diagnosed with Autism. All participants exhibited stereotypic behaviour that encompassed toys and a lack of recognisable appropriate play. Sessions were conducted in their classroom and a second smaller therapy room at the school. This study used a multiple baseline design across participants with an embedded ABA design, with one of the participants and an embedded ABACA design for the other two. This study used lag schedules as an addition to fixed ratio (FR) and variable ratio (VR) schedules of reinforcement. In this study, two play sets were used: a home and an amusement park play set. Lang et al. (2014) used one set for the intervention phases, and the other set for baseline phases, in which generalisation was also measured. Following the initial baseline, phase one

consisted of the experimenter using a least-to-most prompting hierarchy including gestural, model, verbal, and physical prompts to teach appropriate play skills. Lang et al. (2014) recorded appropriate play and stereotyped behaviours. For appropriate play responses the participants received small edibles and social praise as reinforcement that was delivered on a FR1 schedule. The baseline procedure was reintroduced after the FR1 schedule. During the reversal phase, Lang et al. (2014) increases in appropriate play and decreases in stereotyped behaviours were noticed for all three participants for the experimental play set . Only one participant showed increases in appropriate play for the generalisation toy (Lang et al., 2014). As a result, a lag schedule of reinforcement intervention was implemented for the two participants who did not show increases in appropriate play with the generalisation play set (Lang et al., 2014). Both Lag 1 and Lag 2 schedules of reinforcement were implemented with the same play set used in phase 1. Appropriate play behaviours that differed from the previous behaviour according to the lag schedule in place at the time, received reinforcement (Lang et al., 2014). Both participants demonstrated increased occurrences of appropriate play behaviour and a decrease in stereotyped behaviour across both play sets following the lag schedule phase. Lang et al. (2014) reported that appropriate play remained above baseline levels and stereotyped play below baseline levels, at four-, six- and eight-week maintenance probes, for all three participants. This study provides support for the use of reinforcement schedules as an effective intervention to increase appropriate play behaviours and decrease stereotyped behaviours in children with autism. It is difficult to conclude if lag schedules alone could have attained the same changes in appropriate and stereotyped play, since lag schedules were used in combination with FR and VR schedules of reinforcement (Lang et al., 2014). Further research is therefore necessary to investigate if lag schedules alone can lead to changes in play behaviour for individuals with Autism.

Baruni et al. (2014) specifically looked at functional play in their study using a lag 2 schedule of reinforcement to change play variability in individuals with Autism, using a car, toy train and an aeroplane. The participants in the study were a 12-year-old girl with cerebral palsy and global delay, an 8-year-old-boy, and a 6-year-old-boy with autism. All novel responses were measured across sessions as well as the time the children played with the toys (Baruni et al., 2014). The plane, car and train were allocated to the individual children based on the age appropriateness of the toy. Baruni et al. (2014) used a nonconcurrent multiple baseline across participants design. During baseline conditions, the participants were handed the toy and given the verbal command "play". No reinforcers were given for novel play responses during baseline and responses were recorded (Baruni et al., 2014). The lag 1 schedule was put into place during the intervention phase and participants received an edible reinforcer for play responses that differed from the previous one. Baruni et al. (2014) reported that all three participants exhibited increases in novel responses in lag 1. Only the two boys with autism moved onto a lag 2 schedule due to time constraints. This condition was identical to the previous lag 1 schedule; except that only responses that varied from the previous two responses were reinforced with an edible reinforcer. Results for the lag 1 schedule showed an increase in the number of toy responses, but a decrease in engagement. During the lag 2 schedule, only one novel behaviour was measured for each 1, indicating very little increase in novel responses from the participants (Baruni et al., 2014). Similar to Cammilleri and Hanley (2005) findings, the participants also exhibited a decrease in time spent engaging with a toy. A possible reason could be that the reinforcers were edible, and as a result some participants would stop engaging in play to eat their edible. This study is relevant because it looked specifically at functional play, however Sutton (2017) criticised the toys used, which potentially would not have resulted in enough novel responses to allow variability compared to previous studies that have used blocks.

Sutton (2017) extended the work of Baruni et al. (2014) using more functional play sets which included a Fisher-Price Little People Lil' Pirate Ship and a Fisher-Price Little People Animal Sounds Farm for generalisation. The results showed response variation using a lag 5 schedule, but again, to increase the effectiveness of the intervention, the addition of training trials, such as modelling and verbal prompting were needed (Sutton, 2017).

A recent study by Tutty (2021) used lag schedules of reinforcement to increase the play variability across three play settings of a seven year old individual diagnosed with Autism and global developmental delay. The participant was nonverbal and exhibited a limited play repertoire and limited play variability within play. The intervention setting was a room in the participant's home and the toys used based upon the participant's interest and developmental suitability were a ball, music table and playdough. Tutty (2021) used a changing criterion design, embedded in a multiple baseline across settings probe design, for this study. The lag schedule was increased and conditions to obtain reinforcement changed when steady responding was observed. The three dependent variables this study measured, were the average play variability, the number of different play actions that were exhibited in each session and novel responses across sessions (Tutty, 2021). During baseline, the participant was instructed to "play with the ball/playdough/music table" (Tutty, 2021, p. 36) and play was documented, and reinforcement was omitted. During the experimental phase reinforcement was obtained for play actions that varied from the previous number of play actions required for each specific condition. Results showed an increase in play variability and number of different play actions between baseline and intervention for the ball, music play set and play dough (Tutty, 2021). An increase in novel play actions was also recorded for all three toys. Tutty (2021) highlights that the results from this study are comparable with Baruni et al. (2014) and Napolitano et al. (2010). The results also showed that lag schedules can produce generalisation of play variability, which are similar to the findings of Lang et al.

(2014). Therefore, lag schedules appear to be a promising and a viable approach to investigate further. Some of the limitations of this study according to Tutty (2021) were: a limited external validity due to the use of a single case research design, the differences in level of play variability possible across toys and the data and measurement of longer-term outcomes were limited, due to the fact that no follow up probes were conducted, and the only maintenance condition conducted was for the music table setting.

Further research limitations and issues to consider

Nature of the toy

According to Sutton (2017) and Harrison (2020), it is important to carefully consider the type of toys used in a study. In previous studies researchers used blocks that allowed more variability compared to a single toy. The toys need to be a preferred toy for the individual participant in the study and to avoid lack of engagement, the toys need to allow for enough diversity. Harrison (2020) noted that the more elements a toy consists of, the higher the increase in variability and novelty, thus the variability in play varies, contingent on the category of toy provided for the play sessions. In her study it was evident in the differences between the number of variable play actions displayed, with the highest number obtained by the toy set, followed by the outdoor play and then the single toy (Harrison, 2020). Some found that toys that consist of many different parts, such as a play set, yield the greatest variability, whereas others, i.e. Tutty (2021), found that just a single object, namely a ball, can yield elevated levels of varied play. A lot of other factors come into play such as the child's interest. If a child is not interested in balls, that child would probably not play with the ball in a varied way (Tutty, 2021). Tutty (2021) suggested the inclusion of normative data gathered from typically developing children on the level of play variability across different toys when selecting toys for a research study to address the ceiling effect during assessment.

Clinical and applied setting

Another key factor is the level of engagement the children display during play sessions to provide adequate opportunities to exhibit variability (Luk et al., 2019; Sutton, 2017). The engagement level can be influenced by the setting in which the child is observed. An example of a clinical setting would be to isolate the child in a room and provide only assessment toys for the child to play with, such as the setting used in the study conducted by Tutty (2021). In an applied/integrated setting the child would be exposed to other children and a choice of toys or equipment to play with. In the applied setting, the child can be distracted by other children and the choice of toys; and these elements can potentially influence variability in play. This is a limitation in Tutty (2021) that this current study will seek to address.

Current study

The purpose of this study is to investigate the effect of lag schedules of reinforcement to increase play, and specifically variability in play for children diagnosed with ASD. The hypothesis is that lag schedules would increase the play variability of a young child with autism.

Method

Participant and setting

The participant was a 3-year-old boy, who, at the time of the study, was enrolled in a regular early childhood centre. He has not had a formal diagnosis of autism (ASD) but has been referred by the early childhood centre to the Ministry of Education for learning support and a formal assessment. The participant received one-on-one learning support from an educational support worker (ESW) for eight hours a week during his time at the centre. The family's goal for him is to acknowledge other people and to be able to communicate his

needs and choices. His play repertoire was comprised of line patterns, matching, grouping toy items and repetition of the same play behaviour with limited play variability. Sessions for the three different settings took place in the early childhood centre during operating hours. The indoor environment consisted of two separate rooms with different areas of play available to all the children during the day. The large outside area had a bike track, sandpit, gardens and existing outdoor climbing play equipment. Other children were not excluded and could be a source of variability because the participant's responses may depend on other children's proximity and engagement.

Materials

The toy items used in the three different intervention settings were wooden figurine, doll house, fire station play set and a water trough lid filled with water and coloured cups (see Figure 1). These toy items were chosen as they were identified as preferred items based on the feedback from the parents and teachers, and because they were age appropriate and novel to the child.

Figure 1

Toy items

Wooden figurine

Doll house

Fire station play set

Water play

Data recording sheets with possible play behaviours for each setting were designed. Each play behaviour was assigned a behaviour definition and code; this coding system was used to identify, code and measure the dependent variables after each session (see Appendix A). A probe data sheet and an operational definition for approach responses were generated for the generalisation sessions. Each square represents a ten second interval to record instances of approach responses from the participant and other children over time (see Appendix B).

Preference assessment

The reinforcers were determined via a paired choice preference assessment procedure (see Appendix C) and an informal interview with the parents and teachers. The edibles used, banana, orange, biscuit, cruskit, strawberry, cheese, bread with butter and potato sticks, adhere to the early childhood policies and procedures of the centre.

Experimental design

A multiple probe design with a changing criterion design embedded across the three different settings was used to evaluate the effects of lag reinforcement schedules on the participant. All three settings were exposed to baseline. By using a multiple probe design, reducing the time the participant spends with the toy limits unintentional learning that might occur. The multiple probe design is beneficial for behaviours that are learned. During intervention phases, a changing criterion design was used with reinforcement being delivered following responses that met the requirement of the lag parameter. The lag schedule was escalated to the next level once the participant displayed stable play responses in a condition. Three to four sessions were conducted each day, three to four days per week.

Dependant variables measured in this study and definitions

The dependent variables (DV) were: Average play variability, number of different play behaviours and novel responses across sessions. For the purposes of analysis, Tutty (2021, p. 27) definitions were used, which was that 1) the average play variability was "defined as the average number of responses in which each play behaviour differed from the previous play behaviours within sessions". The result was generated by the adding up of all the number of responses in which each play behaviour differed from the previous ones. The total was then divided by the total number of play behaviours in that session (Tutty, 2021). 2) The number of different play behaviours that occurred in each session. "This was defined

as the number of play behaviours that differed topographically within the session" (Tutty, 2021, p. 27). The total number of different play behaviours in the session produced this result. 3) The novel responses across sessions. "Novel responses were defined as those that were not previously observed in any prior session" (Tutty, 2021, p. 27). The list of possible play behaviours was updated when behaviour occurred in a session that was not previously identified. Functional play was not a requirement for this study. Therefore, play behaviour was considered as varied from the preceding play behaviour if changes in topography were observed by researchers, even if the play behaviour might not be considered to be functional.

Independent variable

The intervention used in this study was lag schedule of reinforcement. Lag schedules include the delivery of reinforcement when a response, or sequence of responses, differs from a pre-determined previous number of responses (Page & Neuringer, 1985).

Lag 1

During lag 1 condition, the researcher delivered reinforcement following play responses that met the requirement of the lag parameter; that was behaviour that differed from the previous play behaviour. The lag schedule was escalated to the next level once the participant displayed stable play responses in a condition.

Lag 2

The procedures were identical to the lag 1 schedule condition with the difference of the lag 2 parameter. Reinforcement was delivered following a response that was different from the two preceding play responses.

Generalisation

Generalisation probes were conducted weekly throughout the study, without the intervention being in place. The probe sessions were conducted across the natural play environment of the early childhood centre and other children attending the centre. The toy

settings used in the study were removed from the environment, but similar toy settings were available to the participant and the other children to play with.

Interobserver agreement

The researcher recruited a teacher at the early childhood centre as a second observer to review the videoed sessions for interobserver agreement (IOA). The teacher was trained in the methodology of this study, response definitions were explained and play behaviours modelled. Two videos were used as practice videos to assess the results and the researcher answered any questions the second observer had. Training was considered complete once the second observer coded the play behaviour with 80% accuracy. The teacher independently scored 30% of the recorded sessions from baseline, intervention and generalisation across the three settings. The second observer used the play behaviour descriptions and code sheets (see Appendix A) and data sheets (see Appendix B and D) to assess the selected videos. An interval by interval interobserver agreement method (IOA) was used. The measurement of dependent variables was affected by how the play behaviours were coded and this IOA measured if the play behaviour codes corresponded between the teacher and researcher. Each play behaviour coded by the researcher and second observer was scored as either an agreement, both assigned same code, or disagreement, different codes were assigned to a play behaviour. The number of agreements were divided by the total number of play behaviours coded in the session and multiplied by 100 to get a percentage, to calculate the IOA.

Data collection

Baseline and intervention sessions were limited to two minutes per session, with free play between sessions. Three to five sessions were conducted per day. The sessions were recorded and play behaviours were coded on data sheets and calculated. Play responses were recorded with pen and paper data sheets (see Appendix D) and a mobile phone was used to

make video recordings of all baseline and intervention sessions. During generalisation, a partial time interval recording system was used and probe sessions were limited to 15min.

Data analysis

Data was graphed to illustrate behavioural changes; and the graphs are analysed visually to determine the effect of the independent variable on the dependent variables. This analysis focuses on variability, trend, level, and immediacy of change (Cooper et al., 2020). Variability is how often and how much, responses differ from one another. The trend refers to whether the data is increasing, decreasing, or zero trend, which is the path in which it is moving. Level is the point on the y-axis that is covered by the data points. The immediacy of change is how quick the participant is to respond to the condition change (Cooper et al., 2020). Percentage of non-overlapping data (PND) was used calculate the effect size. This was found by counting the number of favourable outcomes in the intervention phase (the number of data points that are outside the range in baseline) then dividing the number by the total number of data points in the intervention phase and turning it into a percentage (Tarlow & Penland, 2016). Intervention with PND effect size scores below 50% are interpreted as "ineffective", scores 50% to 70% are interpreted as "questionable" and scores of 70% to 90% are interpreted as "effective" and scores above 90% are interpreted as "very effective" (Tarlow & Penland, 2016, p. 222).

Procedure

The participant was recruited via a recruitment letter (see Appendix E) that was handed to a handful of families at the early childhood centre, that had children diagnosed with Autism or in the process of receiving learning support and awaiting a formal assessment. Parents received an information letter about the study (see Appendix F). The participant's family indicated that they were interested in participating in the research. The family's participation in the study was voluntary and the family provided informed consent prior to

their participation in the study (see Appendix G). Parents of other children were notified of the research project and that their child might accidentally be captured on video and thereby given the opportunity to raise their concerns.

For the preference assessment, the participant was seated at the table and was allowed to sample each edible. Two items were placed in front of the participant and he was instructed to choose one. By presenting the pairings of all the objects; each object was paired with every other object and was on every position, either left or right, a preference hierarchy was determined. The items that were chosen more often than other items, and the items the participant preferred the most, functioned as reinforcers. Preference assessment yields clear results and preferences.

To align with ECE policies and the early childhood curriculum, such as child-directed learning and inclusiveness, the researcher conducted sessions in the natural play environment, placed the toy items on a shelf in the playroom and encouraged the participant to request the items prior to the sessions starting. The participant did not have access to the toy items during free play sessions.

Baseline conditions were conducted for each play setting. The participant was provided with the toy item and instructed to play with the toy. The researcher only provided general praise, not contingent on play variability, to encourage the child to play. Examples of verbal praise were, “Good job” and “Well done”. Baseline probe sessions were conducted for the water play and play set settings while experimental sessions were in progress for the figurine and doll house settings. Baseline probe sessions were continued for play set setting once experimental sessions started for the water play setting.

During intervention sessions data collection continued as in baseline but reinforcement was delivered following responses that met the requirements of the lag parameter that was in place at the time. During lag 1, any play responses that were different

from the preceding play responses received reinforcement. For example, if the participant hopped the figurine along the surface and then placed it on the couch in the doll house, reinforcement was delivered. If the participant placed the first figurine upright on the surface and continued to line up the rest of the figurines, no reinforcement was delivered. Lag 2 was introduced for the setting once stable responding was evident in lag 1. Verbal praise was paired with the delivery of the edible reinforcer. The intervention session for the figurine and doll house was implemented first, followed by the water play and then the fire station play set. The break in intervention was due to the fact that the participant first isolated with his family as a household contact and then later tested positive for Covid-19 himself. The study ended early due to COVID-19 restrictions. The intervention ended with lag 2 in the figurine and doll's house and water play settings and lag 1 in the fire station play set.

Results

This study investigated the effect of lag schedules of reinforcement on a child's play variability, as well as the ability for the play skill to generalise to other settings and the effect on peer interactions. Results are discussed in order of the three dependent variables: average play variability, number of different play behaviours and novel play behaviours in the different play settings, as well as generalisation.

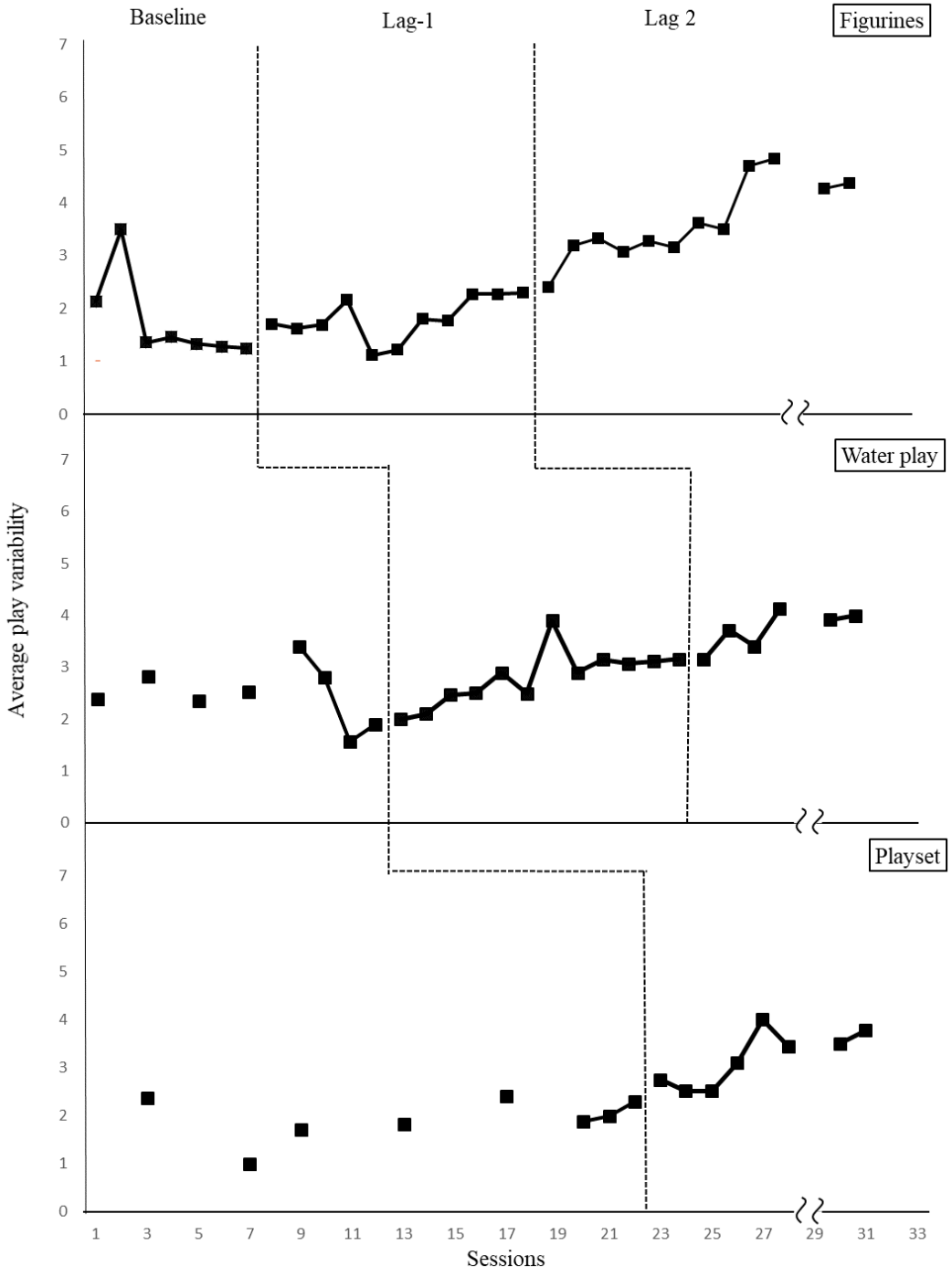
Average play variability

Average play variability was defined as the average number of responses in which each play behaviour differed from the previous play behaviours within each session (Tutty, 2021). Data for average play variability across sessions is presented in Figure 2. The baseline conditions demonstrated a predictable pattern that was compared with the intervention conditions. A visual analysis of Figure 2 indicated an increase in the average play variability between baseline and the intervention conditions in all the settings, as well as between conditions in the settings. A gradual increasing trend was noticed for all the

intervention conditions. However, a slight decreasing trend is visible following the change to lag 1 for the play set setting. The levels between baseline and intervention conditions for all three settings increased based on the data plotted in relation to the Y-axis. A visual analysis of the average play variability line graph was used to plan for intervention sessions. Lag 1 was introduced when a stable data path was visible in baseline for each play setting. Immediacy of change was measured by visual analysis of the data points before and after a change in lag schedule. Evidence of the treatment effect was visible following a change in lag schedule for both the figurine and water play. Responding was moderately stable with limited variability, during all the conditions for all three the settings, with some outliers evident during baseline for the figurine and water play, and during lag 1 for the water play and play set setting.

Figure 2

Average Play Behaviour Variability in session



Mean and range

Table 1 shows the calculated mean and range of average play behaviours within condition. A visual representation of the mean and range for average play variability is displayed in Figure 3. The mean average play variability increased as the lag schedules increased across conditions for all three play settings. The range in lag 1for figurine and lag 2 in water play was small. The range in baseline for figurine and water play, lag 1 for water play and lag 2 for figurine was large. During baseline for the figurine setting, on average, every play behaviour is different from the one before, with a mean average play variability of 1.76 already visible. Only a slight difference is seen between baseline and in lag 1 because there is already variability in baseline and the behaviour is responding to the lag schedule to meet the criteria in place. The last three data points are at two, in lag 1, and meeting the criteria for the current lag schedule in place. During lag 2 schedule, the two preceding behaviours had to be different, before the participant received reinforcement. The average variability had to be three and this is seen in lag 2 with a mean average variability of 3.57. There is a spontaneous increase in variability towards the end of lag 2 conditions, without a change in condition. In the water play setting a similar data path is visible, except in baseline the behaviour already meets lag 1 criteria. The last two data points in lag 1 were stable and the mean average play variability of 2.81 met criteria for lag 1. During lag 2 the mean average play variability increased to 3.6 and data points met criteria in place of four towards the end of the lag 2 condition. In baseline for the play set setting, on average, there are two play behaviours that differ from the previous one, similar to the figurine and water play settings, with a slightly ascending trend just before beginning intervention. Immediate increase is seen after the intervention was introduced and met criteria that are in place for lag 1 condition in place.

Table 1

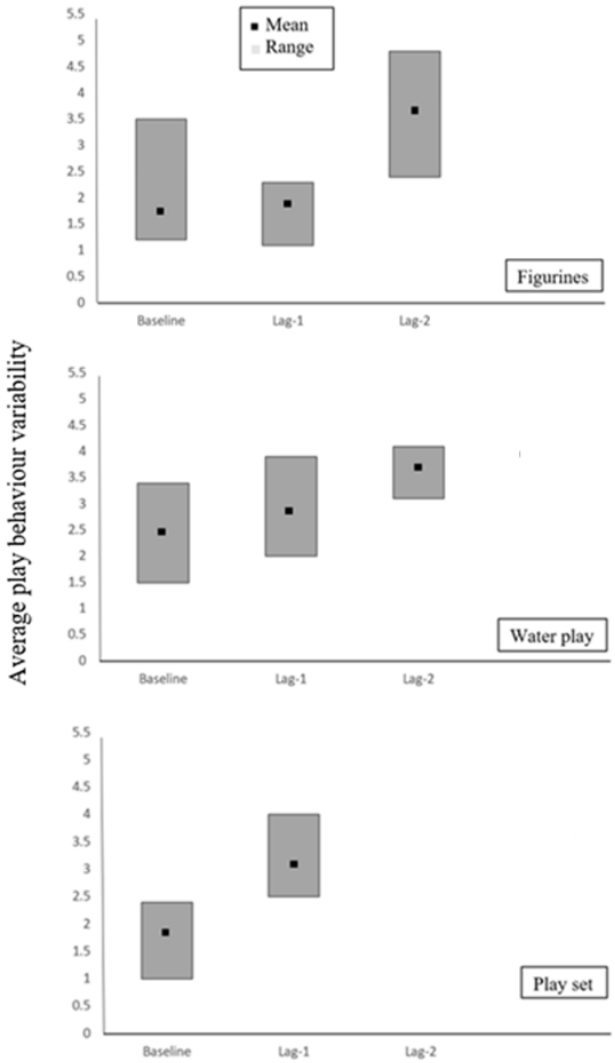
Mean and Range of Average Play Variability in Session Across Conditions

Condition	Figurine setting		Water play setting		Play set setting	
	M	Range	M	Range	M	Range
Baseline	1.76	1.2-3.5	2.47	1.5-3.4	1.93	1-2.4
Lag-1	1.83	1.1-2.3	2.81	2.0-3.9	3.04	2.5-4.0
Lag-2	3.51	2.4-4.8	3.6	3.1-4.1	-	-

Note. Lag-2 condition was not conducted for the play set setting.

Figure 3

Mean and Range of Average Play Variability in Session within Conditions



Effect size

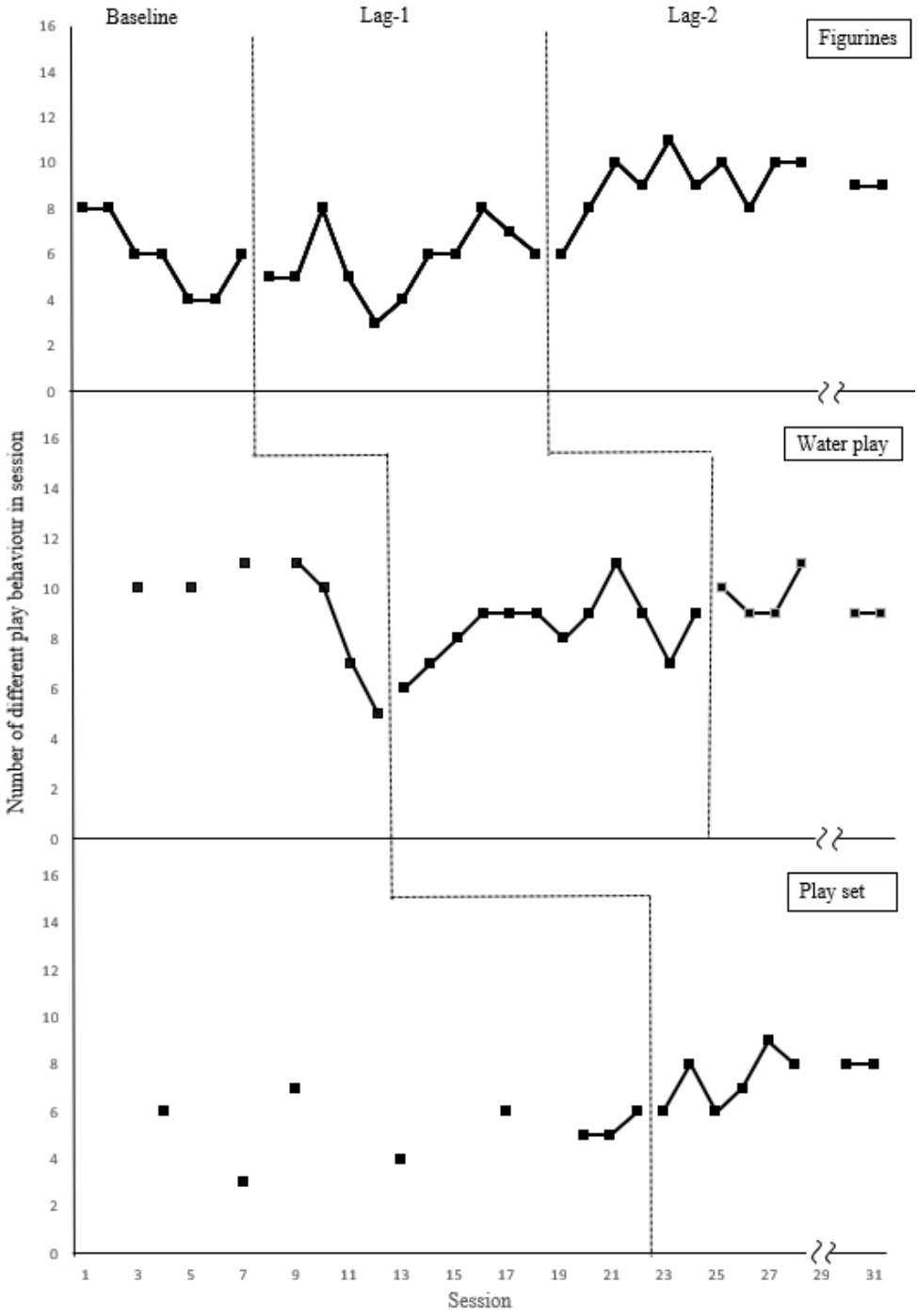
The effect size is a numerical index quantifying the functional relationship between the independent variable and dependent variable (Hedges, 2008). Basically, understanding whether the intervention is more or less effective by considering how much of an overlap there is between the data points across the conditions. Average effects for the figurine and water play setting were calculated between the lag 2 condition and baseline and between lag 1 condition and baseline for the play set setting using percentage of non-overlapping data (PND) (Scruggs et al., 1987). The average play variability in all three settings has some data points that overlap with data in baseline. In the figurine setting, 50% of the data in the intervention phase falls outside the range of the baseline data. The PND was 66% for the water play setting and 100 % for the play set setting.

Number of different play behaviours in session

Data for the number of different play behaviours in each session is presented in Figure 4. The number of different play behaviours was defined as the number of play behaviours that differed topographically within the session (Tutty, 2021). The calculation to work out the number of different play behaviours was adding up the number of different play behaviours coded within the session. A visual analysis of Figure 4 indicated an overall increase in the number of different play behaviours once intervention was introduced for all three settings. The baseline condition in the figurine setting and water play setting demonstrated a decreasing trend, with a level trend for the play set baseline. Despite some outlier data points in the beginning of lag 1in figurine setting and towards the end of lag 1 for the water play, an overall increasing trend is seen for all the intervention conditions and responding was moderately stable. The data in relation to the y-axis during the intervention sessions is at a moderate to high level in all three settings.

Figure 4

Number of Different Play Behaviours in Session



Mean and Range

Table 2 shows the calculated mean and range of different play behaviours within each condition. A visual representation of the mean and range for the number of different play behaviours in session across conditions is displayed in Figure 3. The mean number of

different play behaviours increased from baseline to lag 2 for the figurine and the water play setting, despite the decrease in mean number of different play behaviours from baseline to lag 1 for these two settings. The range in lag 1 for play set and lag 2 for figurine and water play was small. The range in baseline for figurine and water play, was large.

Table 2

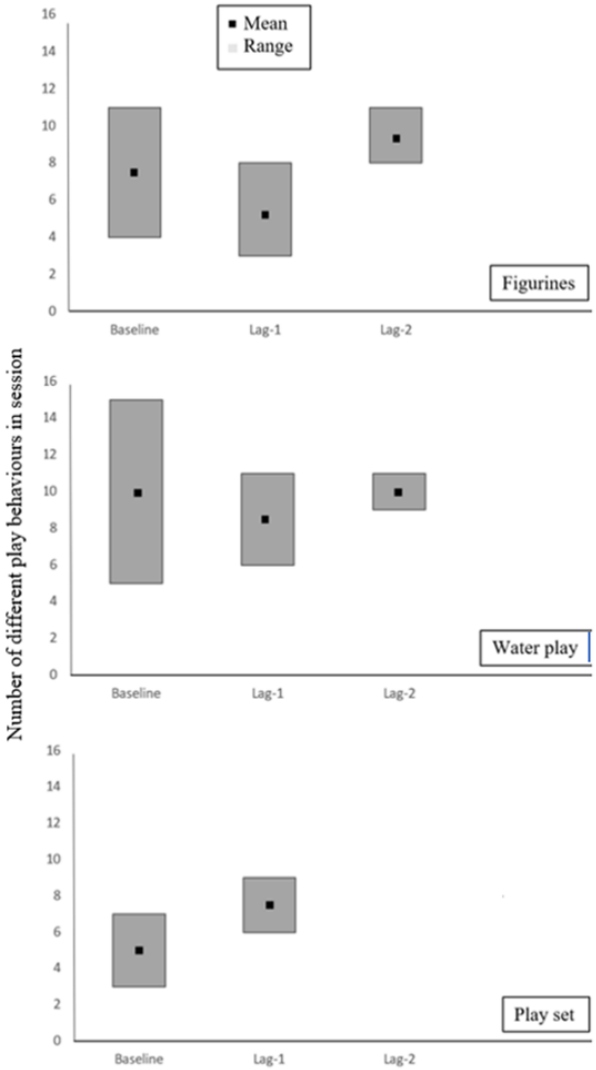
Mean and Range of Number of Different Play Behaviours in Session Across Conditions

Condition	Figurine setting		Water play setting		Play set setting	
	M	Range	M	Range	M	Range
Baseline	7.42	4 -11	9.87	5 - 15	5.25	3 - 7
Lag-1	5.72	3 - 8	8.41	6 - 11	7.33	6 - 9
Lag-2	9.1	8 - 11	9.75	9 - 11	-	-

Note. Lag-2 condition was not conducted for the play set setting.

Figure 5

Mean and Range of Number of Different Play Behaviours in Session within Conditions



Effect size

Average effects for the figurine and water play setting were calculated between the lag 2 condition and baseline and between lag 1 condition and baseline for the play set setting using PND (Scruggs et al., 1987). The number of different play behaviours in sessions in all three settings have some data points that overlap with data in baseline. In the figurine setting, 10% of the data in the intervention phase falls outside the range of the baseline data. The PND was 10% for the water play setting and 75 % for the play set setting.

Cumulative number of novel play behaviours

A novel behaviour was defined as a play behaviour that had not been observed in previous sessions. Data for the cumulative number of novel play behaviours in the figurine setting is presented in Figure 6 and Table 3. The number of novel play behaviours observed in a session were graphed after being added to the number of novel play behaviours plotted for the previous session. A total of 47 novel play behaviours occurred in the figurine setting. 22 of the 47 novel play behaviours were recorded during baseline sessions. Another 12 novel behaviours occurred under lag 1 and 13 under lag 2 conditions each. Data for the cumulative number of novel play behaviours in the water play setting is presented in Figure 7. A total of 42 novel play behaviours occurred in the water play setting. Thirty-one of the 42 novel responses were recorded during baseline sessions. Another nine novel responses occurred under lag 1 condition and another two under lag 2. Data for the cumulative number of novel play behaviours in the play set setting is presented in Figure 8. A total of 26 novel play behaviours occurred in the play set setting. Nineteen of the 26 novel responses were recorded during baseline sessions. Another seven novel responses were observed during lag 1. The slope of the increasing trend line is pronounced for both the figurine and water play settings indicating a high response rate for novel play behaviours for these two play settings. A lower response rate is visible for the play set setting.

Table 3

Number of novel play behaviours across settings

Condition	Figurine setting	Water play setting	Play set setting
Baseline	22	31	19
Lag-1	12	9	7
Lag-2	13	2	-

Note. Lag-2 condition was not conducted for the play set setting.

Figure 6

Cumulative Number of Novel Play Behaviours Observed in Figurine Setting

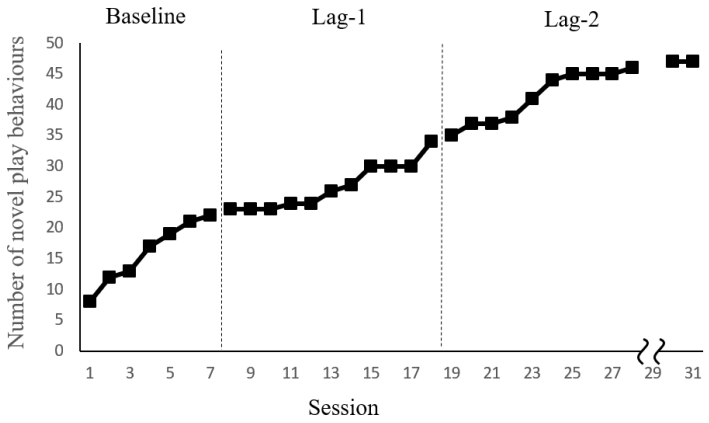


Figure 7

Cumulative Number of Novel Play Behaviours Observed in Water Play Setting

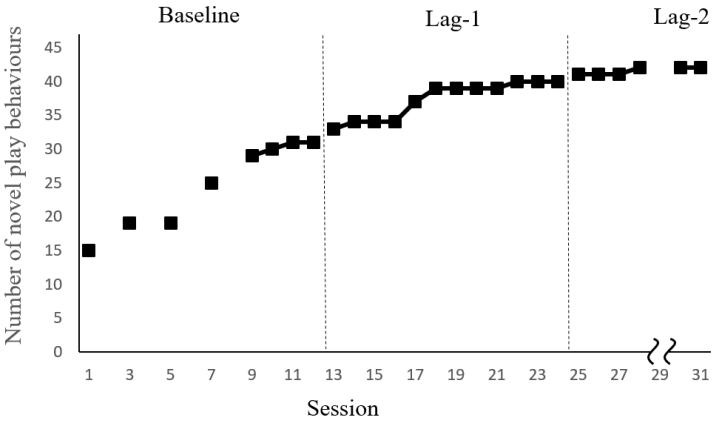
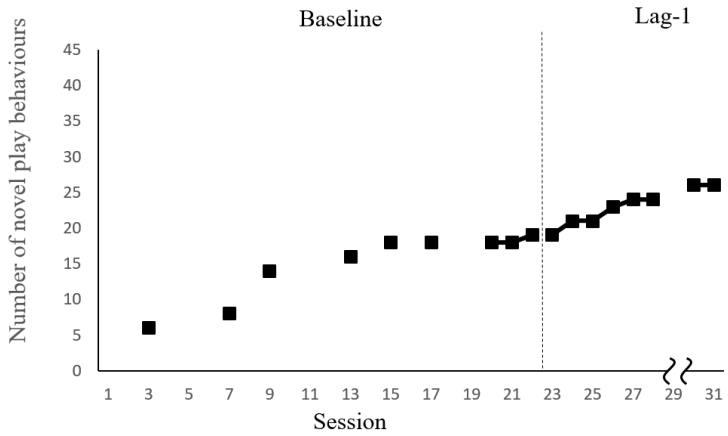


Figure 8

Cumulative Number of Novel Play Behaviours Observed in Play set Setting



Interobserver agreement

Thirty percent of the sessions were independently observed by the second observer, using interval by interval interobserver agreement method. Interobserver drift occurs when IOA between two observers was high at the beginning of data collection and it has since decreased. No interobserver drift occurred over the course of this study with IOA measurements of 96% for baseline, 98% for lag-1, 98% for lag-2 and 100% for peer observations. The two observers consistently had high IOA during the study with 98% for the figurine setting, 97% for the water play setting, 98% for the play set setting and 100% for the peer observations. Mean and range of IOA during sessions are presented in Table 4. The mean IOA for figurine setting stayed above 80%, with 100% during baseline, 98% during lag 1 and 97.5% during lag 2. The mean IOA for water play setting stayed above 80% with 93% for baseline, 97% for lag1 and 100% for lag 2. The same is true for the play set setting with mean IOA above 80% with baseline at 95.5% and lag 1 at 100%.

Table 4

Mean and Range percentage interobserver agreement across settings

Condition	Figurine setting		Water play setting		Play set setting	
	M	Range	M	Range	M	Range
Baseline	100%		93%	86%-100%	95.5%	91%-100%
Lag-1	98%	93%-100%	97%	92%-100%	100%	
Lag-2	97.5%	90%-100%	100%		-	-

Note. Lag-2 condition was not conducted for the play set setting.

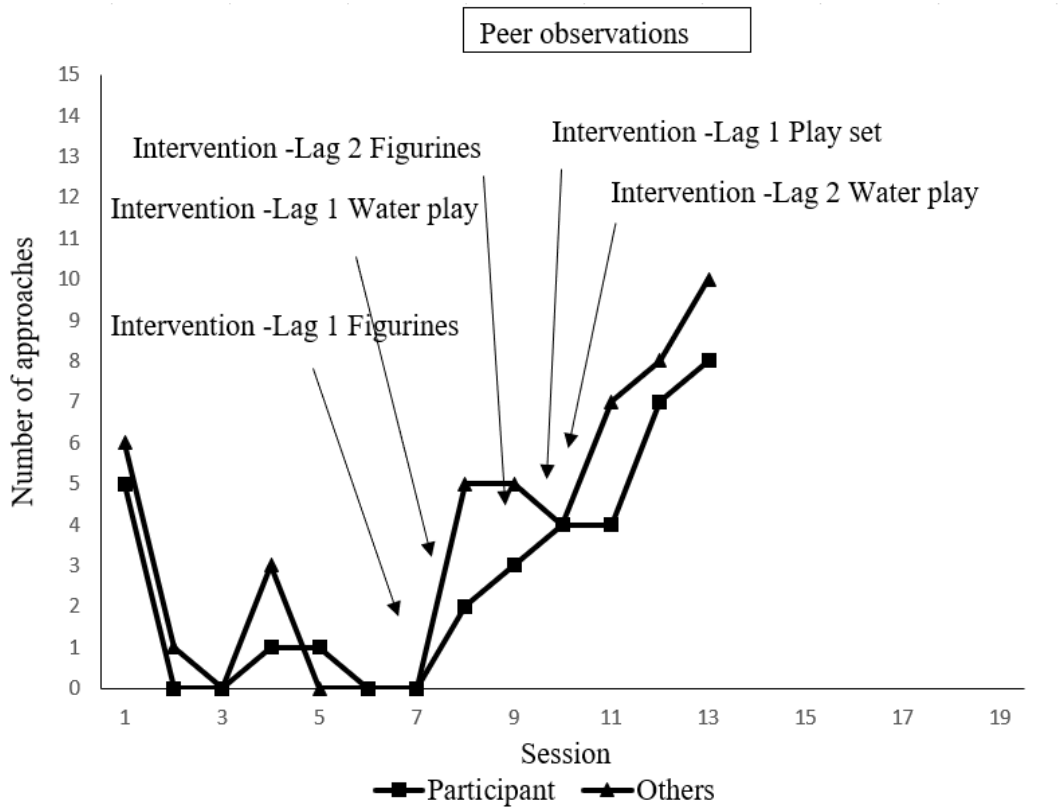
Concomitant beneficial effects in social behaviours

Data for peer interaction is presented in Figure 9. The line graph displays the direction of the data path for peer interactions between the participant and other children.

Data points are mostly level between session one and session seven, with some outliers evident in session one and four. Sessions one to seven for peer interaction were conducted during baseline sessions for all three play settings. Immediacy of change was measured by visual analysis of the data points before and after a change in lag schedule during the intervention session in the play settings. Evidence of treatment effect was visible during session seven of the peer interaction probe sessions, following a change to lag 1 for the figurine play setting. Responding was moderately stable with low variability, and an increasing trend was noticed for both participant and others, once intervention sessions were introduced for all the play settings. The slope of the increasing trend line is pronounced after session seven, indicating a higher response rate for both participant and other children as the lag schedule increased.

Figure 9

Number of Approaches Between Participant and Peers



Discussion

The aim of this study was to investigate the effect of lag schedules of reinforcement on play, and specifically, variability in play for children diagnosed with ASD. It was hypothesized that lag schedules would increase the play variability of a young child with autism. Overall, the results supported the hypothesis. The current study provided a partial replication of the study conducted by Tutty (2021) investigating the effect of lag schedules of reinforcement on play, and specifically variability in play for children diagnosed with ASD. The high IOA lends strength to the validity of the findings as it indicates that the definition of the target behaviour was clear and concise, and the measurement system of the target behaviour was not too complicated. A notable finding was the concomitant changes in peer approaches which adds to the social validity of this study.

Dependent variables

Play variability entails "unpredictability" and is characterised by response diversity and novel responding (Neuringer, 2002, p. 672; Tutty, 2021). Baruni et al. (2014) highlighted the importance of collecting response diversity data alongside novel responding, for future research. This study measured varied play in a number of different ways because the idea of diverse play cannot be measured with a single measurement. The reason for this is because a participant could score high on average play variability without ever acquiring many novel play responses by just toggling between two or three responses. Similar to Tutty (2021) study, response diversity was measured by using average play variability and number of different play behaviours in session, and novel responding was measured by using novel responses across sessions. The use of multiple measures allowed for a more comprehensive assessment of play variability.

Average play variability

Average play variability was the primary DV in this study. Average play variability was found by allocating values to each play behaviour in which that play behaviour differed from the previous behaviours i.e. in play sequence ABCD the play behaviour B is different to the previous one and will be allocated a value of one, and play behaviour C is different to the first two play behaviours and will be allocated a value of two, etc for all of the play behaviours in the session. The total number of all the allocated values was then divided by the total number of responses in the session. A visual analysis of the graphed data indicated an increase in the average play variability, except for a few outlier data points, between baseline and the intervention conditions in all the settings, as well as between conditions in the settings, similar to the findings in Tutty (2021). A possible explanation for the outlier data points earlier on in baseline for figurine setting could be that it was a novel toy to the participant and he was excited about the new toy. Baseline data stabilised over the next five sessions at level 1 followed by an immediate increase in average play variability upon the introduction of the intervention. The mean for lag1 was bigger than the mean for baseline. PND score for average play variability for the figurine setting was only 50%, indicating a questionable treatment effect (Tarlow & Penland, 2016), however, a much clearer demonstration of an intervention effect is visible between lag 1 and lag 2 with very little overlap and a significant increase in the mean between baseline and lag 2. Overall between baseline and lag 2 it has been a highly effective intervention. There is some indication of experimental control when ignoring the first outlier data points in baseline. It is the outlier data points in baseline that result in a low PND because all the data points overlap. Using a different metric that allows for outlier data points would have been better to correctly represent the prevailing trends in data (Lang et al., 2011). The data path for the water play setting is somewhat similar to the figurine setting and indicated an increase in the average

play variability between baseline and lag 2 condition, except for a few outlier data points during baseline and lag 1. The mean for lag1 was bigger than the mean for baseline and then a significant increase in the mean for lag 2. PND score for average play variability for the water play setting was only 66%, indicating a questionable treatment effect (Tarlow & Penland, 2016), however, a much clearer demonstration of an intervention effect is visible between lag 1 and lag 2 with very little overlap, except for the outlier data point in the middle of lag 1. Overall between baseline and lag 2 it has been an effective intervention. There is some indication of experimental control when ignoring outlier data points in baseline and lag 1. It is these outlier data points that result in a low PND. Again using a different metric that allows for outlier data points would more accurately represent the prevailing trends in data (Lang et al., 2011).

The observation of a slightly ascending trend just before the beginning of intervention in the play set setting suggests a possible spontaneous generalisation from the intervention during the figurine and water play settings. There was a significant increase in the mean from baseline to lag1in the play set setting. The PND score was 100 % for the play set setting, indicating a "very effective" treatment effect (Tarlow & Penland, 2016, p. 222). Overall, a very stable level of responding was visible and there was meaningful and beneficial change in the target behaviour as a result of the intervention between baseline and lag 1 and baseline and lag2 for all three the settings.

Number of different play responses

The slight increases seen in number of different play behaviours in session across the play settings demonstrated that lag schedules of reinforcement produced increases in response diversity. However, the number of different play responses in session for all the settings was lower than would be expected, with the exception of the high level at the start of baseline for the figurine and water play setting. Complexity of play could likely be the

reason why the number of different play responses did not increase as much as expected, similar to the findings of Tutty (2021). The capability of the participant to engage in complex play behaviour such as imaginative and symbolic play depends on his current play. The participant's current play (see Appendix C) would be considered cause and effect play and mostly limited to manipulation of the toys.

Novel play behaviour

Novel behaviour across sessions measured novel responding across all settings. Baruni et al. (2014) emphasised the likelihood of ceiling effects when only using novel responding as a measurement of play variability. The inclusion of average play variability and number of different play responses reduced the limitations of this measurement (Baruni et al., 2014; Tutty, 2021). The participant engaged more in novel behaviour for the figurine and water play setting as seen in the cumulative number of novel play behaviours as opposed to the play set setting. The gradual slope for the play set indicated that the participant was slowly responding in novel play behaviour. The number of novel responses differed across the three play settings. A possible explanation is that different play settings allowed for different levels of novel responding (Harrison, 2020). The figurines and water play settings were open-ended and allowed for endless possibilities. The fire station play set demonstrated the lowest number of novel responses as play behaviours were limited by the limited elements the toy consisted of. Thus, it is possible that the novel responses in play varies, contingent on various reasons such as different levels of interest in specific toys and the category of toys provided for the play sessions (Harrison, 2020; Sutton, 2017; Tutty, 2021).

Concomitant beneficial effects in social behaviours

Barton and Wolery (2010); Licciardello et al. (2008); Pierce-Jordan and Lifter (2005) have argued that the low play variability seen in autism might contribute to low levels of interactive play with peers. The frequent use of repetitive behaviour may have a negative

impact on the quality of social interactions with others and limit access to social opportunities of reinforcement (Lang et al., 2014). Luk et al. (2019) explained that the inability to form and sustain new friendships could possibly be due to the child's unvarying responses in speech and play. The peer approaches were measured weekly throughout the study, without the intervention being in place, to measure the changes in interactive play with peers. The probe sessions were conducted across the natural play environment of the early childhood centre and other children attending the centre. An interesting finding was the concomitant changes in the peer approaches. The low variability in the data collected during the peer approach sessions indicated stable responding. The pronounced slope of the increasing trend line indicates an increasing rate of responding. This increasing rate of responding during the peer approaches indicated that the participant was increasingly engaging in social interactions with other children and vice versa. The increase in play variability that occurred due to the use of lag schedules of reinforcement, as suggested by Lang et al. (2014), could have contributed to this change in responding in the peer approaches session. These sessions provided the participant with consistent and frequent opportunity to practise the learned behaviour in an intervention free environment. It is possible that these social encounters could extend his language abilities and verbal communication (McDuffie & Yoder, 2010; Venker et al., 2011; Yoder et al., 2016).

Generalisation

Generalisation refers to instances where intervention effects are observed in other situations where no training occurred. There are three different kinds of generalisations: across settings (including other people or stimulus materials), behaviours, and across time (maintenance) (Cooper et al., 2020). Increases seen in average play variability in the figurine setting were associate with concomitant increases in the water play and play set setting. This possible spontaneous generalisation across settings compromises the extent to which

experimental control is demonstrated in this study. However, it was a positive outcome from a therapeutic perspective as generalisation is important for teaching play behaviour to a child because it is not possible to teach play with every individual toy to increase their play variability. Spontaneous generalisation might contribute to the social validity of the intervention.

Contributions to the literature

The main contribution to the literature was that data was collected on peer approaches between other children and the participant throughout the study. A suggestion for future research could be to investigate the social encounters and its possible effect on the language abilities and verbal communication of children with ASD as suggested by McDuffie and Yoder (2010); Venker et al. (2011); Yoder et al. (2016). The current study adds to the findings of Napolitano et al. (2010), Baruni et al. (2014) and Tutty (2021), that supported the use of lag schedule of reinforcement to increase the average play variability in children with ASD. The levels for all three dependent variables improved across all the play settings. These findings were similar to those of Baruni et al. (2014), Sutton (2017) and Tutty (2021). This study extended the research by Tutty (2021) and Harrison (2020) through a number of procedural differences. The participant was exposed to other children and opportunities for distractions during intervention and generalisation sessions, as opposed to being isolated in a separated room and only provided with the assessment toys. During the intervention sessions the participant did not seem to be distracted by other children and the choice of toys around him and was engaged in the play setting provided. The environment the participant was observed in, i.e. the early childhood centre, most likely made high level of engagement in the peer interactions and the measurement of this possible (Luk et al., 2019; Sutton, 2017). Therefore, the results of this study supported the use of the lag schedule to generate an increase in average play variability in children with ASD and specifically it adds to the social

validity of play variability as a target behaviour (Baruni et al., 2014; Lang et al., 2014; Miller & Neuringer, 2000).

Limitations and future research

Due to COVID-19 restrictions, the study was interrupted towards the end. This led to the current study's limitations that warrant discussion. Firstly, the most important limitation is the limited evidence. This study only showed limited experimental control since to demonstrate experimental control three replications of an intervention effect at three different points in time were needed. Another limitation was the use of only lag 1 and lag 2 schedules of reinforcement similar to studies done by Baruni et al. (2014), Lang et al. (2014) and Napolitano et al. (2010). The results from Tutty (2021, p. 54) showed that "overall higher lag schedules led to higher play diversity". Furthermore, responding already met criteria for the lag 1 condition during baseline for the water play and play set setting, therefore there was minimum motivation to increase average play variability during lag 1 schedule. A more significant increase in average play variability might have been possible if intervention had started with lag 2 schedule of reinforcement.

The use of PND to measure effect size is another limitation of this study. The result of this was that the prevailing trends in data was not represented correctly due to the outlier data points in baseline (Lang et al., 2011) To remedy deficiencies of PND, using a different metric that allows for outlier data points would have been better. This could be addressed in future studies by using non-overlap of all pairs (NAP) as used by Lang et al. (2011). NAP (Parker & Vannest, 2009) is an index of data overlap similar to PND but more robust to the effect of outliers.(Lang et al., 2011).

Lastly, the absence of a maintenance phase adds to the limitation of this current study. The maintenance phase is to determine if the increase of play variability and an increase peer interaction, continue to be visible in the participant's play behaviour following a period of

time without ongoing play intervention. Future researchers may consider conducting a maintenance phase and follow up sessions for the peer observations.

Conclusion

Overall, the results of this study and incidental observations showed that lag schedules of reinforcement led to an increase in average play variability and greater novel play behaviour in children with ASD. If average play behaviour variability increased but the number of different play behaviours and novel play behaviour did not; the participants might have been alternating between existing play behaviours, which limit the social validity of the effects. This study included the measurement of not just average play variability, but also the number of different play behaviours and number of novel responses and was able to demonstrate that the increase in variability was also associated with the appearance of novel play behaviours. The use of multiple measures allowed for a more comprehensive assessment of play variability. During the course of the study, the participant's engagement with other children in the early childhood centre increased noticeably.

This study provided a base for future research that could lead to a better understanding of how lag schedules of reinforcement can be used to teach valuable play to children with ASD, which could have a significant impact on their social, language and communication skills. We have concluded that play variability is an important and socially valid target behaviour that could lead to other desirable behaviour such as increased social interaction and possibly increases in language development.

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Appendix A

Play behaviour descriptions and assigned code for each setting

Play set: Experimental – Fire Station	
Code	Play behaviour
1a	Open / close station garage
1b	Open / close station gate
1c	Open / close /turn track door
1d	Open / close police door
1e	Open / close gate on level 1
1f	Open / close yellow car lift
2a	Turn water hose
2b	Move water hose up and down
2c	Press yellow water tank
2d	Pretend to spray water with water hose
3	Push red fire man up and down
4a	Push car up track to level 1
4b	Push car up track to level 2
5a	Park car in station garage
5b	Park car behind station gate
5c	Park car on service hoist
5d	Park car in yellow car`1qw lift
5e	Park car in police lockup
6a	Lift car in yellow lift
7a	Push car down track to level 1
7b	Push car down track to ground level
8a	Push red button
8b	Push blue button
9	Press yellow lever to lower tracks in police lock up
10	Alternate between police car and fire engine
11	Push car on surface next to play set
12	Push car up fire/water hose
13	Place car on yellow lift
14	Sit on play set
15	Park car on top
16	Inspect car while holding
17	Tip play set to remove stuck car
18	Turn play set around
19	Inspect play set
20	Spin vehicle wheels
21	Spin track door

Waterplay	
Code	Behaviour
1	Touch water with hands
1a	Splash water
2a	Stands in water
2b	Lay down in water trough
3	Pick up 1 cup
3b	Pick up more than one cup
4	Throw 1 cup
4a	Throw more cups
5	Stacking cups
6	Scrambling cups
7	Lining up cups
8	Grouping cups
9	Counting cups
10	Sing song whilst playing
11	Humming song whilst playing
12	Placing/balancing cups on his head
13	Pushing cups away
14	Gathering cups
15	Sing song whilst playing
16	Scoop up water with cup
16a	Scoop up water in more than one cup
17	Fill cups with water using other cups
18	Pouring water from cups back into water trough
18a	Throw water up in air
18b	Tip water on his head
19	Drink water from cup
20	Banging cups together
21	Jumping into water
22	Jumping in water
23	Kick water
24	Lift cup with holes to pour water
25	Pretend to share a cup of tea with friend
26	Sit down in water
27	Unstack cups
28	Pour water on head from cup
29	Pouring water on himself (body) not head
30	Slash water with cup
31	Drink water from trough
32	Put finger inside cup
33	Push cups in container
34	Spit water out
35	Push cup around in trough
36	Place cups in container
37	Blow bubbles

38	Unpack cups out of container in trough
39	Pour water from cup into container
40	Placing cup up right
41	Place feet in water
42	Walk on hands and feet
43	Kick/splash water with feet
44	Sit on container

Little figurine: Colourful wooden figurine (no detail)	
Code	Play Behaviour
1	Pick up figurine – one at a time
1a	Pick up figurine – one at a time - fast
2	Standing up figurine on a surface
2a	Knocking them over
2b	Knocking them over – one by one
3	Pushing into each other
4	Scrambling the figurine
5	Lining up - standing
5a	Lining up – lying down
6	Grouping figurine lying down
6a	Grouping figurine standing
7	Rolling figurine across surface
8	Hopping (pretend walking)
9	Flying
10	Little figurine interact with each other (facing each other)
11	Little figurine interact with the child (bringing the figurine closer to his face)
12	Shaking figurine
13	Talk to figurine
14	Sing to figurine
15	Remove figurine from play surface
16	Sing/acting out song 1 whilst playing (Daddy finger)
16a	Sing/acting out song 2 (Ten in the bed)
17	Placing/balancing figurine on head
18	Pushing figurine away
19	Gathering figurine
20	Figurine interact or use doll’s house
20a	Figurine interact or use woven basket/packet away
21	Counting figurine
22	Figurine dancing
23	Grabbing a bunch of figurine
24	Banging figurine together
25	Stacking figurine
26	Free fall

27	Bunching figurine together
28	Figurine flying
29	Throwing figurine
30	Taking figurine from another child
31	Pushing 1 figurine into another figurine
32	Dropping figurine
33	Twisting figurine in hand
34	Packing away figurine in basket
35	Placing figurine in mouth
36	Move basket with figurine
37	Laying figurine down on surface
38	Play with staircase
39	Play with furniture
40	Figurine climb staircase
41	Play with house
42	Figurine play in doll's house
43	Figurine sit on couch

Appendix B

Probe data sheet for peer observations

DATE:	OBSERVER:								PARTICIPANT:					INTEROBSERVER:					
Indicate by circle: baseline or experimental phase each square = 10 sec intervals (total for this sheet = 15min) √ for approach + for positive response and – for no response / no approach																			Comments:
Participant approaches others	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	
Others approach participant																			
Participant approaches others																			
Others approach participant																			
Participant approaches others																			
Others approach participant																			
Participant approaches others																			
Others approach participant																			
Participant approaches others																			
Others approach participant																			

Appendix C

Two-item (Paired- Stimulus) Preference Assessment Summary Sheet

Child identifier: _____ Date: _____

The results from the recent preference assessment that have been tabulated. Below is a list of the 8 stimuli that were used in the assessment, and the percentage of trials on which those items were selected (keep in mind that if a participant was selecting items randomly, was not scanning the array, or was picking based on a position, that each item would be selected on 50% of trials). Note: each stimulus was presented a total of 14 times in 56 trials.

Number	Stimulus	# Trials selected	% chosen: # trials selected/14
1			
2			
3			
4			
5			
6			
7			
8			

High preference items- Those stimuli selected on 80% or greater opportunities
Moderate preference- Those stimuli selected on 50-80% of opportunities
Low preference- Those stimuli selected on less than 50% of opportunities

High preference	Moderate preference	Lower preference

Appendix D

Data recording sheet

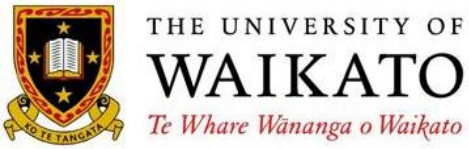
Date:	**Childs initials:**	**Setting:**
Lag schedule:	**Session #:**	**Reinforcer used:**

Response number	Behaviour	Behaviour code	reinforcer was delivered (X)	Comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

Total # of responses:		# of novel responses:	
# of different responses:		Average response variability:	
Coded behaviours			
Novel behaviours			

Appendix E

Recruitment letter to parents



To whom it may concern,

You are being sent an invitation to participate in a study as part of Anna de Koster's Master of Psychology thesis study because you have a child with limited language and social skills. The purpose of this study is to investigate whether lag schedules of reinforcement (delivery of preferred items at predetermined times) can be used to increase variability, flexibility and novel play in children with limited language and social skills.

Increasing play variability and flexibility has potential benefits which have been shown to increase exposure to learning opportunities and gains in language and social skills. If a child can play with a toy in multiple ways, they are more likely to have exposure to social interactions which will in turn, enable further learning opportunities and exposure to more language. Therefore, over time, this method- if successful could benefit your child's learning, language and social interactions.

We are aware you and your child have a relationship with Anna as a teacher and we would love to have your child involved in our project. However, Anna and Angelika would like to emphasise that regardless of your response, your relationship with Anna as your child's teacher, providing early childhood education for your child will not change.

If you are interested in finding out more information about the study please contact either Anna de Koster at anidekoster@gmail.com or her Supervisor, Associate Professor Angelika Anderson at angelika.anderson@waikato.ac.nz", or by phone: 07 837 9209

"This research project has been approved by the Human Research Ethics Committee of the School of Psychology. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email ethics@waikato.ac.nz, postal address, School of Psychology, Faculty of Arts and Social Sciences, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240."

Best wishes,
Anna de Koster

Appendix F

Information sheet provided to parents

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Associate Professor Angelika Anderson
Faculty of Social Science
Waikato University
Phone: 07 838 4466 ext 9209
Email: angelika.anderson@waikato.ac.nz

Anna de Koster
anidekoster@gmail.com

Study Information Form

Dear Parents / guardian
Your child has been chosen to participate in a research project conducted by myself, Anna de Koster, under the supervision of Associate Professor Angelika Anderson from the Faculty of Social Science at the University of Waikato. This project is part of the requirement for the completion of my Master of Applied Psychology in Behaviour Analysis at the University of Waikato and is sponsored by the university. Please read this information sheet in full. If you would like further information about the project, please contact myself or Associate Professor Anderson via the contact details above.

Study name: Can an intervention using lag schedules of reinforcement increase the number of novel play acts produced by a child with limited language and social skills?

Purpose of the research: The purpose of this study is to investigate whether lag schedules of reinforcement (delivery of preferred items at predetermined times) can be used to increase variability, flexibility and new play in children with limited language and social skills.

What you will be asked to do in the research: This study aims to increase your child's play variability by rewarding your child for producing novel (new) acts of play over three different settings/ play activities. These include, an individual toy (for example, plane, car, doll), a play set (e.g. doll house, farm yard or superhero play set) and the playground.
As part of this study, your child will be required to participate in a number of 5-10-minute sessions throughout the week, for a number of weeks. The exact frequency and number of sessions will vary depending on the individual however based on similar projects conducted in the past, observations are likely to be conducted 3-4 times a week for a period of 8 weeks. Whilst this sounds like a high investment of your and your child's time, these sessions will involve your child engaged in developmentally appropriate and likely beneficial activities. During these sessions, your child will be presented with the individual toy, play set or the playground to play with and will receive reinforcers (e.g. preferred items, food or social rewards such as high fives) when they display new ways to play with the toy or try new playground items. A preference assessment will be conducted prior to the toys/ playground being introduced to ensure we are using rewards that motivate your child.

We also ask if you (parents) could please fill out a questionnaire at the end of this study to provide the researchers with some feedback about the outcomes of your child's progress after the sessions have been completed.

Finally, at the end of the study we would also like you to take and share with us a brief video of your child at play in their own natural environment. This information is extremely beneficial to us as it's important to hear your thoughts on how your child's behaviour has changed since taking part in the study and will help us assess the acceptability and value of the study for your child.

Video recordings: Video recordings will be taken during the sessions with your child. These videos will be used to ensure that sessions are being delivered effectively and to assess for interobserver agreement. A second observer will have access to 20-30% of these video recordings in order to conduct interobserver data/ reliability checks to ensure a degree of consistency between observers. This individual will not have direct contact with your child at any time and will only be reviewing the video recordings. They will sign a non-disclosure agreement in which they agree to not release any information about the study or your child to the public. Any videos taken of your child will be stored securely and password protected.

Risks and discomforts: We do not foresee any risks or discomfort from your child's participation in the research. Should your child display signs of distress at any point, for example crying or showing two instances of escape behaviour such as running of in a session, that session will be terminated immediately. Using food as a potential reinforcer can mean there is the possibility of harm to the participant due to allergic reactions. Your child will be monitored carefully throughout for any adverse reactions.

Potential benefits of this study for your child: Increasing play variability and flexibility, has potential benefits such as, increased exposure to learning opportunities and gains in language and social skills. If a child can play with a toy in multiple ways, they are more likely to have opportunities for social interactions which will in turn, enable further learning opportunities and exposure to more language. Therefore, over time, this method- if successful could benefit your child's learning, language and social interactions.

Potential benefits of the research: Any findings from this study will contribute to the current research about the use of lag schedules to increase play variability. Whilst this is the first of its kind in New Zealand, similar studies have been produced around the world. Further evidence regarding effective methods for children with limited language and social skills can help inform the use of these methods in day to day programming to bring benefits to children with limited language and social skills and their families.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop your child's participation in the study at any time up until the final session, for any reason. To withdraw you must inform Anna de Koster that you wish to withdraw. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name or your child's name will not appear in any report or publication of the research. This research will be submitted as part of the course work requirement for the Masters of Psychology at the University of Waikato, in

this work a different name will be used rather than your child's real name. Information and data will be collected in digital form and handwritten notes. Your data will be safely stored in a locked filing cabinet and digital copies will be password protected. Videos taken during the study will be uploaded to a secure cloud-based program and be password protected. Videos will then be deleted off the device used to capture them.

Funding of the research: This research is conducted as part of the requirements for the Master of Psychology at the University of Waikato. It is not supported or receiving funding from any groups or organizations.

Access to findings: The results will be presented within my Masters thesis. Once the thesis is submitted and reviewed the public will have access to this via the university of Waikato thesis database. They may also be presented in the form of a peer reviewed journal article and / or conference presentation. If requested, a summary of the report can be prepared and sent to you.

Questions about the research? If you have questions about the research in general or about your child's role in the study, please feel free to contact Anna de Koster by email at anidekoster@gmail.com

"This research project has been approved by the Human Research Ethics Committee of the School of Psychology. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email ethics@waikato.ac.nz, postal address, School of Psychology, Faculty of Arts and Social Sciences, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240."

Kind regards,

Anna de Koster

Appendix G

Consent form

School of Psychology

CONCENT FORM

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Research Project: Can an intervention using lag schedules of reinforcement increase the number of novel play acts produced by a child with limited language and social skills?

Please complete the following checklist. Tick (✓) the appropriate box for each point.	**YES**	**NO**
1. I have read the Participant Information Sheet (or it has been read to me) and I understand it.		
2. I have been given sufficient time to consider whether or not to participate in this study		
3. I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet		
4. I understand that taking part in this study is voluntary and that I may withdraw my child from the study at any time without penalty		
5. I have the right to decline to participate in any part of the research activity		
6. I know who to contact if I have any questions about the study in general.		
7. I understand that the information supplied by me could be used in future academic publications.		
8. I give permission for my child to be video recorded.		
9. I agree to the data being added to a larger bank of data to be used by the supervisor of this project for her wider project of play variability		
10. I agree to participate in a parent feedback questionnaire once my child has finished sessions.		
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I wish to receive a copy of the findings		
I wish to view the summary report of my child's observation		

Declaration by participant's parent/ caregiver:

I agree to my child, _____ being a participant in this research project and I understand that I may withdraw my child at any time. If I have any concerns about this project, I may contact the convenor of the Psychology Research and Ethics Committee (Professor Nicola Starkey, phone 07 837 9230, email: nicola.starkey@waikato.ac.nz)

Participant's name (Please print): _____

Signature: _____ Date: _____

Researcher's name (Please print): _____

Signature: _____ Date: _____