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**Using modelling for teaching social skills to children with autism:
A literature review & effects of video-modelling on the acquisition
and generalisation of play behaviour in children with autism**

Claire R. Paterson
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Using Modelling for Teaching Social Skills to Children with Autism:

A Literature Review

&

Effects of Video-modelling on the Acquisition and Generalisation

of Play Behaviour in Children with Autism

Claire R. Paterson

A Report Submitted in Partial Fulfilment of the Requirements for the Award of Honours
in Psychology, Faculty of Community Studies, Education and Social Sciences, Edith
Cowan University.

Submitted: October 2004

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Acknowledgements Page

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Running head: MODELLING AND CHILDREN WITH AUTISM

Using Modelling for Teaching Social Skills to Children with Autism:

A Literature Review

Claire R. Paterson

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Abstract

Impaired social functioning is a characteristic feature of autistic spectrum disorder. Various interventions have been developed to address social dysfunction in children with autism. The purpose of this paper is to review studies that have examined the efficacy of using modelling procedures to teach children with autism social skills. Modelling involves observing a model performing a target behaviour intended for the observer to imitate. Modelling techniques have effectively incorporated a range of models including adults, peers, and target children by observing videotapes of themselves. Peer-mediated strategies have been shown to substantially increase social behaviour in children with autism, however generalisation is limited. The use of videotaped models has been successful in both skill acquisition and generalisation. Applications of video technology and suggestions for future modelling research are discussed.

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Submitted: October 2004

Using Modelling for Teaching Social Skills to Children with Autism:

A Literature Review

A great deal of research has focused on exploring procedures for teaching children diagnosed with Autism Spectrum Disorder. Autism appears in childhood and is characterised by a lack of social responsiveness, linguistic and communicative impairments, and deficiency in the development of normal attachment (American Psychiatric Association, 2000). A major challenge in teaching children with autism is the development of interventions that lead to engagement in social interaction (Taylor, Levin, & Jasper, 1999). Children with autism show impaired ability in joint attention concerning various social behaviours including play, initiating conversations and responding to social initiations by others (American Psychiatric Association, 2000). One teaching procedure used with children with autism that has generated much research is modelling. Modelling involves the child observing another person performing a target behaviour (referred to as the model) and then attempting to imitate the modelled behaviour (Charlop-Christy, Le, Freeman, 2000). Imitation, which occurs when the observer performs the modelled behaviour, produces response-contingent reinforcement (Bandura, 1977). Reinforcement can be both contrived (e.g., edible rewards) or natural (e.g., positive social interaction, enjoyment from toys). This paper will review modelling studies that investigate the efficacy of teaching children with autism social skills through modelling procedures. Reviewed studies include interventions incorporating adult and peer models, peer mediated strategies, and video-modelling approaches. The majority of studies (over 90%) employed single participant research designs to assess the impact of modelling techniques. The advantages of video-modelling interventions in comparison to alternative strategies are discussed, as are suggestions for future modelling research.

Early Research on Modelling

Observation and imitation of others can account for the natural acquisition of behaviour (Bandura, 1977). A great deal of research has found modelling results in the learning of behaviour in typically developing children (Bandura, 1977; Hanna & Meltzoff, 1993; Mastropieri & Scruggs, 1985; Meltzoff, 1985; Poulson, Kymissis, Reeve, Andreatos, & Reeve, 1991). In particular, modelling can account for speed of social and language skills acquisition (Kymissis & Poulson, 1994). Given the opportunity for social modelling in classrooms, it is important to understand the degree of learning in children with autism resulting from modelling procedures (Charlop-Christy et al., 2000).

Early research on teaching children with autism through modelling procedures produced modest results (Varni, Lovaas, Koegel, & Everett, 1979). A systematic assessment of observational learning with 15 children with autism, aged 5 to 16 years, found only a small portion of adult-modelled responses was acquired. Varni et al. (1979) proposed that use of adult models, rather than models more similar to the observers, may have hindered imitation. However, the children's level of functioning may have influenced the findings as the participants were described as functioning at a level of severe intellectual retardation and exhibited very low levels of expressive speech.

Although results from Varni et al. (1979) only provided moderate support for using modelling procedures with children with autism, findings from later research were more encouraging. Egel, Richman, and Koegel (1981) found typically developing peer models were able to successfully teach four children with autism, aged 5 to 9 years, discrimination tasks (i.e., shapes, colours, prepositions). Peers modelled the correct response, and, provided prompts and social praise. Correct responding rapidly increased from baseline ranges of 10% to 50% correct, to the 80% criterion during the modelling

intervention. These skills were maintained after the removal of the models, and although the long-term maintenance of gains was not examined, support was found for the use of modelling procedures for teaching children with autism. Egel et al. proposed that the similarity of the model to the participating children may have aided in the observational learning of tasks. Also, the children in Egel et al.'s study possessed greater language and imitation abilities than those in the study by Varni et al., suggesting there may be a prerequisite level of functioning of the children with autism for learning through modelling procedures to occur.

Further research examined the efficacy of using peers to teach children with autism. Charlop, Schreibman and Tyron (1983) demonstrated that children with autism can learn through observation of other children with autism. Four low-functioning children with autism, aged 4 to 14 years, learned to perform a receptive labelling task. Two to three days after skill acquisition the generalisation of skills was assessed in a novel setting with an unfamiliar adult. Generalisation was found to be greater when participants were taught through modelling in comparison to trial and error procedures. The less restricted structure of modelling, in terms of stimulus control and proximity to natural learning methods, may have aided in the facilitation of greater generalisation of skills, in comparison to more restrictive teaching methods such as trial and error. Slightly superior skills maintenance was also found for those who learned via the modelling procedure. Charlop et al.'s study contributed substantial understanding of the use of modelling procedures with children with autism. The children that participated in Charlop et al.'s study were described as functioning at a substantially lower level than those who participated in Egel et al.'s (1981) study and therefore offered support to observational learning and modelling for both moderate and low functioning children

with autism. In addition, the effective use of children with autism as models for their peers suggested great applicability in educational settings.

Later research demonstrated that developmentally delayed peer models can also be used to teach appropriate play behaviours to children with autism. Tryon and Keane (1986) found that three boys with autism, all aged 4 years, displayed increased levels of appropriate play with two unfamiliar toys, following the observation of appropriate toy-play by a developmentally delayed peer. Appropriate play generalised across new toys and was maintained at both one and three weeks postgeneralisation period. The effectiveness of teaching play skills to children with autism through peer observation is an important finding. The ability to learn appropriate play behaviour through observation of others may lessen the social isolation experienced by children with autism, as typically developing peers are aware of the atypical behaviour of these children (DiSalvo & Oswald, 2002). Importantly, observational learning from peers may provide children with autism with a natural method of learning that can generalise to various settings, such as schools (Tyron & Keane, 1986).

Peer Mediated Strategies

Inclusion of children with autism into mainstream school settings is a major goal for most behavioural programs. Social impairment in children with autism is widely documented, and increasing social interaction between children with autism and typically developing peers may be achieved by integration into mainstream classrooms (Laushey & Heflin, 2000; Rogers, 2000). A great deal of research on classroom-based interventions was generated following the successful demonstration of peer modelling procedures in children with autism. The shift in focus to peer-mediated approaches stemmed from the consideration of the natural context of children's social interaction (Rogers, 2000). In addition, teaching children social skills in their natural social context

does not require supplemental training to generalise skills learned from adults to peers (DiSalvo & Oswald, 2002).

Social Impairment in Children with Autism

A central characteristic of autism involves deficits in social interaction skills (American Psychiatric Association, 2000). The social impairment of children with autism has been proposed as the most important deficit and involves lessened ability to interact with other people in a manner that is reciprocally reinforcing (Koegel, Koegel, Hurley, & Frea, 1992; McConnell, 2002). Children and adults with autism have difficulty in acquiring communication skills, relating to others, and adapting to different social contexts (DiSalvo & Oswald, 2002; McConnell, 2002). Although the level of social interaction between children with autism and adults has not been shown to consistently differ from that of typically developing children, the frequency of social interaction with peers is often significantly impaired (Koegel, Koegel, Frea, & Fredeen, 2001).

Impairments in appropriate nonverbal behaviours (e.g., facial expressions, body posture, gestures and eye contact) create difficulty in regulating social interaction (American Psychiatric Association, 2000). Deficits in social development in children with autism can be seen in the first few years of life and include lack of response to common social stimuli, such as responding to their name, (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998), and atypical obsessive interests, such as map books (Barry et al., 2003).

Peer-mediated interventions aimed at increasing social skills of children with autism have included those aimed at increasing both initiations and responses of children with autism with typically developing peers, and also peer training to encourage social interaction with children with autism (McConnell, 2002; Rogers, 2000). According to social learning theory, observed behaviour needs to be reinforced for learning to occur (Bandura, 1977). Peer-mediated strategies use peers to model socially appropriate

behaviour, in both contrived and natural contexts. Peers are encouraged to give social reinforcement, such as praise, to children with autism when they behave in a socially appropriate manner. Structured training of typically developing peers has been used to foster social initiation and interaction with children with autism and include peer-tutoring and pivotal response training techniques (Kamps, Barbetta, Leonard, & Delquadri, 1994; Hundert & Houghton, 1992; Pierce & Schreibman, 1995, 1997). Proximity techniques involving environmental variations such as integrated playgroups, involve little peer training and have also achieved positive changes in the social behaviour in children with autism (Roeyers, 1996; Wolfberg & Schuler, 1993).

Peer-tutoring

Several studies have examined the use of peer tutors to promote incidental learning of various social behaviour in children with autism including community skills (Blew, Schwartz, & Luce, 1985), social interaction (Kamps et al., 1994; Laushey & Heflin, 2000), and play skills (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992). Kamps et al. (1994) examined the impact of peer tutoring on social interaction of three high-functioning boys with autism, aged 8 to 9 years. Each week a different peer tutor worked together with a target child on reading and free-time activities, each lasting between 15 to 30 minutes. Social interactions between the boys and typical peers significantly increased, as did the academic performance of those with autism. However the endurance of gains is unclear as no generalisation and maintenance measures were employed.

Laushey and Heflin (2000) investigated whether pairing two five year old children with autism each with a typically developing peer-buddy would increase unprompted social interactions. All class members were assigned different buddies each day. Peer buddies were instructed to remain with their buddy and play together. The

peer-buddy approach resulted in high levels of appropriate social interaction with the boys with autism in comparison with simple proximity to typically developing peers. Follow-up data were collected for one target child during play activities and suggested that gains were maintained in a new classroom the following school year. However it is not known if gains in social interactions would have been maintained if novel children (i.e., children who did not participate in the peer-buddy program) were included. Peer-mediated interventions involving peer-prompting and reinforcement have also been adapted from short, structured sessions to all day interventions to enhance generalisation (Kohler, Anthony, Steighner, & Hoyson, 2001).

Pivotal Response Training

Peer mediated social skills interventions have been effective in increasing appropriate social interactions between children with autism and their peers, however, such interventions have been limited in terms of the generalisation and maintenance of interactions (Chandler, Lubeck, & Fowler, 1992). Naturalistic interventions that use less structured training techniques, such as pivotal response training (PRT), incorporate procedures aimed at improving generalisation (Kohler et al., 2001; Pierce & Schreibman, 1995, 1997).

Pierce and Schreibman (1995) used peer-implemented PRT to increase social interactions between children with autism and typical peers in the classroom. Two 10 year old peer trainers were taught PRT procedures such as modelling, role playing, and instructional prompting to increase social interactions with two target children with autism, also aged 10 years. Following peer training, PRT strategies were applied by the peers in the classroom without direct teacher supervision. Improvements in language skills and increases in both social initiation and joint attention were found. Gains were maintained during the 2-month follow-up, however the degree of generalisation across

untrained peers was limited. Unfamiliarity of the untrained peers with children with disabilities was posited as a possible explanation of this finding.

The study was replicated by Pierce and Schreibman (1997) with the additional aim to address limited generalisation of PRT across untrained peers. The findings of increased social behaviour by two children with autism, aged 7 and 8 years, supported those of the earlier study. The inclusion of eight peer trainers per target child, in comparison to one in the earlier study, appeared to enhance generalisation across untrained peers. However, the number of untrained peer probes was limited to only two postbaseline occurrences for each child. According to Pierce and Schreibman (1997) the use of PRT with multiple peer trainers to teach social skills to children with autism offers a potentially effective alternative to an adult trainer in busy school settings. Although generalisation of skills developed by PRT appears to be greater than that achieved in some peer-mediated studies, both treatments require resources to train both teachers and peers in relevant procedures, and for some schools this may not be achievable.

Integrated Playgroups

Close proximity of children with autism to typically developing peers is not sufficient to foster social interaction (DiSalvo & Oswald, 2002; Gresham, 1984). However, social interaction between children with autism and peers has been effectively increased by providing a structured environment to optimize opportunity for social modelling and interaction (Roeyers, 1996; Wolfberg & Schuler, 1993). Wolfberg and Schuler (1993) found integrated play groups approximately doubled the amount of social interaction between three 7 year old boys with autism and typically developing peers. Time spent in functional play increased while levels of repetitive play decreased. Reports from parents and teachers suggested the gains in social interaction generalised to new

settings. However, improvements were not maintained following the withdrawal of the treatment.

In a large-scale investigation Roeyers (1996) examined the influence of integrated play groups on children diagnosed with either autistic disorder or pervasive developmental disorder not otherwise specified. The study included 85 children, aged 5 to 13 years, randomly assigned to an experimental or control group. Treatment included the pairing of each target child with a typically developing peer who had been informed about autism, but not specifically trained. Target children in the experimental group experienced increases in social interaction, which included responsiveness, social initiations, and time spent in interaction. No positive changes were observed in the control children. Although some generalisation of interaction gains was found to both typically developing and handicapped novel peers, the social interactions of the target children remained inconsistent. The findings from studies on integrated playgroups suggest that proximity approaches can benefit children with autism in terms of increased social interactions and play skills. However, the maintenance of such gains is unclear and substantial resources are required to facilitate such groups.

Efficacy of Alternative Strategies

There is need for cost-efficient treatment alternatives to intensive peer-mediated strategies. This need seems greater given the limited generalisation and posttreatment reduction of targeted behaviour. According to Biederman and colleagues many gains in targeted behaviour drop below baseline levels once treatment is withdrawn (Biederman, Fairhall, Raven & Davey, 1998). The posttreatment removal of intended social reinforcers (i.e., social praise) and instructional prompts (i.e., physical and verbal guidance) may result in the extinction of newly learned behaviours (Biederman, Davey, Ryder & Franchi, 1994; Biederman et al., 1998). In addition to the limited ability of

schools to employ sufficient generalisation training, instructional techniques and reinforcement may actually impede learning of developmentally delayed children by providing too much information for the children to process, while focusing on the pertinent stimulus (Biederman et al., 1998). The attentional deficits in children with autism have been well documented (Courchesne et al., 1994; Pierce, Glad, & Schreibman, 1997).

Several studies by Biederman and colleagues have found simple passive observation of models superior to interactive instruction and verbal prompts for teaching children with developmental delay. Biederman, Ryder, Davey, and Gibson (1991) found passive observation of simple tasks (i.e., hair brushing, tying shoe laces) was more effective in teaching children with developmental delay than interactive instruction (i.e., using hand-over-over-hand prompting). Biederman et al. (1994) compared the use of hand-over-hand instruction with passive observation for teaching a variety of tasks (e.g., colour sorting, number matching, dressing) to 12 developmentally delayed children. Children were aged 4 to 10 years and had a range of diagnoses including autism, Down syndrome, and cerebral palsy. Passive observation was compared with hand-over-hand instruction, both with and without social reinforcement. Rating scores from multiple judges suggested passive modelling produced better task performance than hand-over-hand instruction. Findings also indicated that verbal reinforcement was counterproductive and may be confusing for some children with developmental delay in terms of uncertainty in what behaviour is being reinforced. Superiority of passive modelling over instructional techniques was also found in later research with developmentally delayed children (Biederman et al., 1998).

It is important to note that these comparative studies by Biederman and colleagues have only examined the teaching of simple tasks, such as self-care skills,

puzzles and basic academic tasks. It is unclear whether the superiority of passive observational learning in comparison with instructional methods would occur for social skills training, such as initiating conversation. However, the proposed superiority of passive modelling techniques coupled with the consistent lack of generalisation and high-costs (i.e., planning and training) found for peer-mediated strategies, and the finding that children with autism learn equally well from both peer and adult models (Ihrig & Wolchik, 1988), gives reason to investigate economical alternative treatments, such as video technology.

Video Technology

Visual Learning

Visual interventions have been successful in teaching a variety of skills to children with autism (Shipley-Benamou, Lutzker, & Taubman, 2002). Many children with autism have particularly strong visual perception and processing skills (Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988; Quill, 1997), and a number of studies have examined the use of visual cues to facilitate understanding and learning in these children (e.g., MacDuff, Krantz, & McClannahan, 1993; Pierce & Schreibman, 1994; Thiemann & Goldstein, 2001). Advanced visual skills are demonstrated in some children with autism who develop sight-reading at early ages and those with hyperlexia, in which word and symbol recognition exceeds age appropriate levels (Grigorenko et al., 2002; Kistner, Robbins, & Haskett, 1988).

Visual cues including social stories, written prompts and scripts have been used to successfully teach children with autism (Krantz & McClannahan, 1993, 1998; Sarokoff, Taylor, & Poulson, 2001; Thiemann & Goldstein, 2001). Video priming has also been used to effectively reduce disruptive behaviour in children with autism (Schreibman, Whalen, & Stahmer, 2000). Shipley-Benamou et al. (2002) taught children

with autism daily living skills (e.g., setting the table, feeding pets) by using instructional videos filmed from the children's perspective (i.e., as if they were performing the task). Computers have also been used to teach generative spelling to children with autism via video footage of models and reinforcement with entertaining graphics (Kinney, Vedora, & Stromer, 2003). Recently a great deal of research has been generated in examining the efficacy of using of videotaped models to teach various skills to children with autism.

Video-modelling

Several studies have examined the efficacy of using video-modelling in teaching children with autism new behaviours, or, to alter existing behaviours (Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; D'Ateno, Mangiapanello, & Taylor, 2003; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Nikopoulos & Keenan, 2003). Video-modelling is defined as the viewing of a videotape of a model performing specific behaviour for the observer to imitate (D'Ateno et al., 2003; Nikopoulos & Keenan, 2003). Conversation skills, self-care skills and developmental tasks have been effectively taught to children with autism using video-modelling techniques. Video-modelling has been used in conjunction with other strategies, such as reinforcement, and demonstrated encouraging results, particularly in terms of generalisation (Charlop-Christy et al., 2000).

Video self-modelling has been effectively used to teach children various skills such as self-help and communication skills (Buggey, Toombs, Gardener, & Cervetti, 1999; Wert & Neisworth, 2003). Video self-modelling involves the viewing of videotape footage by an observer that shows only the positive performance of a targeted behaviour by the observer (Buggey et al., 1999). Sherer et al. (2001) examined the effectiveness of teaching answers to conversation questions (e.g., "What are your favourite games?", "Where do you live?") to five children with autism, aged 3 to 11 years, using video-

modelling with both “self” or “other” as the model. In the self-modelling videotapes, the children viewed themselves as the model, while peer models were shown in the other modelling videotapes. No difference in the rate of response acquisition was found between the two video-modelling conditions. Overall support was found for the use of video technology for teaching children with autism. However, two children failed to acquire the correct responses. The children who achieved the most rapid acquisition of responses were described as possessing extraordinary visual memories. Sherer et al. proposed that well developed visual processing abilities may be necessary for children with autism to learn from video-modelling procedures.

The children who reached acquisition also generalised responses to a novel peer and setting, which was maintained during the 2-month follow-up. The generalisation and maintenance of skills over time support Charlop and Milstein’s (1989) findings on endurance of behaviour learned via video-modelling procedures. However, development of a self-modelling videotape for a child with autism can be difficult (Sherer et al., 1999). The process requires that the child with autism performs the behaviour appropriately while being videotaped, that the child and the pertinent stimuli are in the video-frame, and time to edit-out any prompts or inappropriate behaviour (Sherer et al., 1999). Given the findings by Sherer et al. on the comparability of learning resulting from self-modelling and “other” modelling procedures, the applicability of using self-modelling in light of the complexities in making such a videotape may preclude this procedure as a desirable treatment. This may explain why the majority of the research on video-modelling as a technique for teaching children with autism has involved peer or adult models.

Community skills. Video-modelling techniques have been used to teach community skills to children and youths with autism. Haring et al. (1987) demonstrated

generalisation of purchasing skills across community settings with three youths with autism through video-modelling. Participants were taught simple purchasing skills and social responses at a school cafeteria and a convenience store. Training failed to generalise to other community settings. Generalisation training was implemented and involved watching short videotapes (ranging from 90 to 180 seconds in length) of familiar typically developing peers making purchases in the generalisation stores, and, answering questions about the video. Verbal praise was given for correct responding and video training resulted in generalisation across the community settings, and maintenance of purchasing skills over a 2-week period. Haring et al. suggested that video-modelling used in conjunction with concurrent training in the natural setting can be used to effectively teach complex tasks.

A similar study by Alcantara (1994) found that a videotape instructional package resulted in the acquisition and generalisation of grocery purchasing skills in three children with autism, aged 8 to 9 years. Each child viewed a total of 30 videotapes (with an average duration of 7.5 minutes), ten for each of the three settings (grocery store, drugstore, and convenience store). The videos showed the experimenter making grocery purchases which was based on a 32-step task analysis of purchasing skills. Purchasing skills were acquired and successfully transferred to the natural store environments. Prompting and social reinforcement (e.g., "Good job!") was used at the stores. In vivo training (i.e., live modelling) was also required to master four of the task steps and therefore offered some support for Haring et al.'s (1987) findings on the requirement of concurrent video and in vivo training. However, it is possible that the need for simultaneous in vivo training was due to high degree of task complexity (32 steps) and the number of videos required. There is great applicability of video-modelling procedures for teaching community skills to children with autism in school settings. Teaching social

skills such as community-focused training requires access to specific environments which may not be easily achieved through classroom-based learning (Alcantara, 1994). In addition, using video models to teach community skills in school settings require less time for training and transportation, and can be easily executed in comparison with physical outings (Carothers & Taylor, 2004).

Social interaction skills. Video-modelling procedures have also been used to effectively teach children with autism a range of social skills including conversation skills (Charlop & Milstein, 1989), play-statements (Taylor, Levin & Jasper, 1999), play sequences (Charlop-Christy et al., 2000; D'Ateno et al., 2003), social initiation (Nikopoulos & Keenan, 2003, 2004) and perspective taking skills (Charlop-Christy & Daneshvar, 2003; LeBlanc et al., 2003). Charlop and Milstein (1989) examined the use of video-modelling to teach conversation skills to three children with autism aged 6 to 7 years. The children viewed a 45 second videotape of two familiar adults discussing specific toys three times. A therapist then determined if observational learning had occurred by engaging in the same dialogue as shown in the video. Edible reinforcers were presented for maintaining appropriate task behaviour (i.e., eye contact, sitting well) and for correct responding. Following the video exposure all the children acquired conversational speech, which generalised across people, settings, toys and untrained topics. The conversation skills were maintained over a 15-month period.

Charlop and Milstein's (1989) study clearly demonstrated that children with autism can be taught to discuss appropriate topics with adults through video-modelling procedures. Similar to research on peer-mediated strategies, video-modelling interventions have attempted to teach children with autism social skills to facilitate increases in social interaction. Taylor, Levin and Jasper (1999) used video-modelling to teach two boys with autism, aged 6 and 9 years, to make play-related comments towards

their siblings. The first child acquired scripted statements during play sessions with his sibling after viewing a videotape showing his sibling and an adult engaging play-related dialogue. The second child acquired both scripted and unscripted play-related comments following a forward-chaining procedure, in which the videotape of his sibling and an adult engaged in play-related dialogue was divided into segments. The number of segments viewed by the child was gradually increased until all the videotaped segments were shown. Each videotape contained an average of ten comments. The video-modelling procedure, which was reinforced with verbal praise and edible rewards, was effective in increasing scripted play statements for all three play activities. Taylor et al. proposed that the expressive language abilities may explain why only the second child acquired both scripted and unscripted play comments, however, it is possible implementation of a forward-chaining technique may have facilitated response generalisation.

It is characteristic of children with autism to exhibit deficiencies in symbolic and imaginative play (American Psychiatric Association, 2000). In free-play settings children with autism typically engage in ritualistic and repetitive behaviour (Tryon & Keane, 1986). Such stereotypic play behaviour may help to explain the social isolation of children with autism. Typically developing peers are often very aware that the behaviour of children with autism is different and efforts to interact with these children may be reduced because of the peer expectations caused by such differences (DiSalvo & Oswald, 2002).

Video-modelling has also been used to address the characteristic deficiencies in play behaviours in children with autism. Charlop-Christy et al. (2000) found that in comparison to in vivo modelling, video-modelling led to faster acquisition of developmental skills (i.e., play, self-help) for four out of five children with autism, aged

7 to 11 years. One child reached criterion performance after only two presentations of both the in vivo and video-modelling task. Each child was shown two tasks, one by a video model, one by a live model, and instructed to imitate the modelled behaviour. Verbal prompts and praise were given for attending the model or television screen. Findings clearly suggested that skills presented by the video model were more rapidly acquired than those shown by the live model. In addition, generalisation of tasks across people, settings and stimuli occurred only for the video-modelling condition. The lack of generalisation of skills found in the in vivo condition replicate the deficits in generalisation found in peer mediated interventions, suggesting some underlying mechanism in video-modelling procedures which facilitates generalisation. Given the applicability of video-modelling procedures in terms of providing a cost-efficient and effective treatment in comparison to in vivo modelling, the generation of further research is not surprising.

Video-modelling techniques have also been successful in teaching complex play sequences to children with autism. D'Ateno et al. (2003) found video-modelling led to rapid acquisition of both verbal and motor play skills in one girl aged 3 years with autism. Viewing videotaped play sequences (e.g., tea party, baking) of an adult model resulted in increases in modelled verbal and motor responses. D'Ateno et al.'s study differs from other research on video-modelling as the procedure did not include reinforcement, prompts or correction, and, the play session occurred an hour after video observation. The increase in play behaviour was attributed solely to the video-modelling condition, and therefore offers support for the suggestion by Charlop-Christy et al. (2000) that television attendance by children with autism may be inherently reinforcing. However no generalisation measures were employed, and no follow-up was conducted. D'Ateno et al. suggested that the use of only one video vignette for each play sequence

may have resulted in the lack of novel responding. This finding supports the notion of multiple exemplar training to increase response generalisation found in peer-mediated interventions (e.g., Pierce and Schreibman, 1997).

There are two important findings of D'Ateno et al.'s (2003) study; first, the child engaged in independent play without prompting, reinforcement or correction procedures, and secondly, play sessions occurred an hour after watching the video, suggesting great applied potential. One of the main goals of any behavioural intervention is for the achievement of extensive periods of appropriate behaviour without the need for intervention by others. Parents and teachers of children with autism would value treatment in the form of a simple technology that would help to achieve goals of independence (Schreibman et al., 2000; Sturmey, 2003).

Further research has supported the efficacy of using video-modelling procedures to increase appropriate play in children with autism. A study by Nikopoulos and Keenan (2003) found video-modelling effective in improving social initiation and appropriate play in four out of seven developmentally delayed children. Participants viewed a 35 second video of one of three models (a familiar adult, unfamiliar adult, or, normal peer) initiating play with the experimenter. The children that experienced enhanced social initiation also generalised responding across toys, peers, and settings and maintained improvements at both the 1 and 2 month follow-up. The failure of the method to enhance social and play skills in three children was attributed to the absence of pre-existing play skills and occurrence of disruptive behaviour that interfered with attending the television. The findings on the influence of prerequisite skills on the success of video-modelling procedures in skills acquisition highlights important considerations in the implementation of such as strategy. Nikopoulos and Keenan suggested that the success of video-modelling procedures is dependent on children possessing a basic level of play and

imitation skills prior to such an intervention. Extensive training in imitation skills was proposed as a method to enhance benefits of video-modelling.

Increases in social initiation and appropriate play were also found in a later study by Nikopoulos and Keenan (2004) with three boys with autism, aged 7 to 9 years. The presentation of toys in a video display was proposed as altering the reinforcing effectiveness of the toys, and, that the presence of toys may enhance motivation to engage in social initiation and reciprocal play following video training. The possibility that video-modelling procedures can be used to successfully alter contingencies naturally occurring in the social context of children with autism warrants further investigation.

In addition to conversation and play skills, video-modelling has achieved positive results in teaching perspective-taking, that is, the ability to understand another person's mental state and explain and predict consequential behaviour (Charlop-Christy & Daneshvar; Le Blanc et al., 2003). Development of perspective-taking ability, termed "theory of mind" is absent or significantly delayed in children with autism (Baron-Cohen, Leslie, & Frith, 1985). LeBlanc et al. (2003) effectively taught perspective taking skills to three children with autism, aged 7 to 13 years. The children viewed a videotape of an adult correctly responding to common perspective taking tasks (i.e., hide and seek, the Sally-Anne task). The videotape included the model explaining the strategy used to respond correctly, while the video focused on the pertinent visual cues and reinforcement given to the model. Video-modelling and reinforcement resulted in all the children mastering the perspective-taking tasks, however, generalisation of skills to untrained tasks was limited.

A similar study by Charlop-Christy and Daneshvar (2003) was also effective in using video-modelling to teach perspective-taking skills to three children with autism, aged 6 to 9 years. Considerable stimulus and response generalisation was found by

Charlop-Christy and Danesvar (2003) in comparison to the generalisation found by LeBlanc et al., possibly due to the multiple exemplar training used. The success of video-modelling procedures to teach perspective-taking skills to children with autism may aid in the development of social competencies in these children, lessening the social isolation often reported (DiSalvo & Oswald, 2002; Wert & Neisworth, 2003). Indeed, effective options in interventions based on theory of mind is needed given the challenges of teaching subtle social behaviours to children with autism, and the limited success of existing techniques (Pemer, Frith, Leslie, & Leekam, 1989; Swettenham, 1996). However, studies employing video models to develop perspective-taking skills in children with autism have found relatively little response generalisation. In addition, Charlop-Christy and Danesvar reported variable outcomes across children, suggesting further development of video-modelling procedures is required to effectively teach perspective-taking skills to all children with autism.

Benefits of Video-modelling

Video technology is a growing area of research for behavioural interventions for individuals with autism and other developmental disabilities (Sturmey, 2003). The video-modelling studies reviewed in this paper demonstrate the efficacy of using video models to teach appropriate behaviour to children with autism. The findings that video-modelling procedures can be used as a powerful tool for teaching a range of behaviours, such as community skills and various social skills, suggests such procedures are robust approaches for teaching and supporting appropriate behaviours in children with autism. One possible explanation of the effectiveness of video-modelling may be due to the use of television as a teaching aid. Television is an engaging medium and has the ability to capture and maintain the attention of children with autism (Charlop-Christy et al., 2000). Inadvertent modelling by family members involving television watching at home, in

conjunction with the low-demand activity of video-viewing may enhance the motivation of children with autism to learn (Shipley-Benamou et al., 2002). As in typically developing children, television watching appears to be naturally reinforcing for children with autism. As video viewing is widely accepted and used source of leisure, education and business information for non-handicapped individuals, video support offers a socially acceptable treatment alternative (Sturmey, 2003).

Video-modelling interventions can be used in a range of social, language and academic programs and can include self, peer, or adult models of appropriate target behaviour (Sherer et al., 2001; Sturmey, 2003). Independent learning can be achieved through video-modelling through reduced need for adult presence (Shipley-Benamou et al., 2002). Added social pressures, such as eye contact, may be distracting to children with autism (Charlop & Milstein, 1989). The possibility of learning without need for social interaction may lessen the anxiety experienced by children with autism in social situations, and may enhance skill acquisition (Charlop-Christy et al., 2000; Stephens & Ludy, 1975).

The ability for edited videotapes of models to focus on the relevant stimuli may also facilitate learning given the widely documented attentional deficits found in children with autism (Courchesne et al., 1994; Pierce, Glad, & Schreibman, 1997). Focus on the pertinent stimuli, while reducing distractions may facilitate the extraction of the relevant information by the observer (Charlop-Christy et al., 2000). In addition, while watching video models, children with autism need only focus on a small spatial area in comparison with a live model, and, the language used can be kept simple and to a minimum (Sherer et al., 2001). This may be one method of dealing with stimulus overselectivity, which is an attentional deficit involving limited ability to use important environmental cues (LeBlanc et al., 2003; Shipley-Benamou et al., 2002). Video-modelling has been

described as presenting concepts in a more systematic and simple manner than in vivo modelling, and requires less cognitively demanding contexts (Stephens & Ludy, 1975).

In comparing benefits of video-modelling versus in vivo modelling, Thelen, Fry, Fehrenbach, and Frautschi (1979) outlined four significant advantages of using video models. Firstly, video-modelling tapes are able to include a wide range of naturalistic settings that would prove difficult to achieve as part of in vivo or classroom interventions. A second advantage involves the greater degree of control possible in the presented video content through the editing and filming of footage until optimal. Another benefit of video models is the ability of the observer to repeatedly view the footage, without need for the model to be present. Lastly, Thelen et al. proposed that video-modelling tapes can be reused with different clients, facilitating the service of a greater number of people. Charlop-Christy et al. (2000) investigated the cost-efficiency of video-modelling and found time spent training and implementing the video-modelling procedure was one third that of in vivo modelling. Additionally, the cost of employing the video model was approximately half that of the live model.

A significant finding of research on video-modelling interventions involves generalisation across novel people, settings, and responses (e.g., unscripted comments). Charlop-Christy et al. (2000) found generalisation of various behaviours (e.g., language and play skills) across different settings, stimulus and people for those tasks taught via video-modelling techniques, but not for tasks taught via in vivo modelling procedures. Further support for enhanced generalisation has been found in several video-modelling studies (Alcantara, 1994; Charlop & Milstein, 1989; Haring et al., 1987; Nikopoulos & Keenan, 2003, 2004; Taylor et al., 1999). Televisions are present in the natural environment of children with autism and may therefore act as a "common stimuli" which facilitates generalisation (Charlop-Christy et al., 2000; Stokes & Baer, 1977). Such

generalisation findings are significant given the limited generalisation found for behaviours taught to children via traditional instructional techniques (e.g., prompting and reinforcement) such as those found in peer mediated strategies (Kamps et al, 1994; Laushey & Heflin, 2000; Pierce & Schreibman, 1995, 1997).

Directions for Future Research

Although positive behaviour change has been found in children with autism with various levels of functioning, it is currently unknown to what degree pre-existing skills and abilities influence learning through modelling procedures. Comparative studies are required to determine which skills may be necessary (e.g., imitation and play skills) to benefit from the observation of both live and video models. Pre-intervention imitation training may be required, as suggested by Nikopoulos and Keenan (2003). Also, studies are needed to address the possible limits on the superiority of passive observation, in comparison to interactive instruction, found by Biederman and colleagues (Biederman et al., 1994, 1998). This could be achieved by the incorporation of more complex tasks, such as social skills training. In addition, further studies are required to determine under what circumstances (e.g., task type, pre-existing skills, functioning level of child) learning from video models is superior to that of live models.

Although some research has investigated the teaching of play skills to children with autism (Charlop-Christy et al., 2000; D'Ateno et al., 2003; Nikopoulos & Keenan, 2003, 2004), generalisation of specific play skills (e.g., appropriate use of figurines) across novel toys has not been assessed. If a basic repertoire of play skills is required to maximise social initiation interventions it would be of interest to determine if video-modelling can facilitate the generalisation of play behaviour across different toys. The problem of generalisation of behaviour taught through traditional strategies, such as peer mediation, could also be addressed by video-modelling techniques. Video-modelling

procedures could be used for generalisation training of social skills taught by peers, and form part of a comprehensive treatment package.

Conclusion

The past 20 years has seen the generation of a great deal of research on interventions for teaching social skills to children with autism. Research on modelling interventions, such as peer modelling, peer mediated strategies, and video-modelling, has demonstrated modelling as an efficacious method for teaching appropriate behaviour to children with autism. The relative ease of implementation and cost-efficiency of video-modelling procedures, in comparison to in vivo interventions, supports the generation of further research on the possible applications for teaching children with autism.

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Example: Retired officers retain access to all of the university's educational and recreational facilities (Columbia University, 1987, p. 54).

H. Personal letters, telephone calls, and other material that cannot be retrieved

are not listed in References but are cited in the text.

Example: Jesse Moore (telephone conversation, April 17, 1989) confirmed that the ideas. . .

I. Parenthetical references may mention more than one work, particularly when ideas have been summarized after drawing from several sources. Multiple citations should be arranged as follows.

Examples:

- List two or more works by the same author in order of the date of publication: (Gould, 1987, 1989)
- Differentiate works by the same author and with the same publication date by adding an identifying letter to each date: (Bloom, 1987a, 1987b)
- List works by different authors in alphabetical order by last name, and use semicolons to separate the references: (Gould, 1989; Smith, 1983; Tutwiler, 1989).

All references must be complete and accurate. Where possible the DOI for the reference should be included at the end of the reference. Online citations should include date of access. If necessary, cite unpublished or personal work in the text but do not include it in the reference list. References should be listed in the following style:

Journal Article

Gardikiotis, A., Martin, R., & Hewstone, M. (2004). The representation of majorities and minorities in the British press: A content analytic approach. *European Journal of Social Psychology*, 34, 637-646. DOI: 10.1002/ejsp.221

Book

Paloutzian, R. F. (1996). *Invitation to the psychology of religion* (2nd ed.). Boston: Allyn and Bacon.

Book with More than One Author

Natarajan, R., & Chaturvedi, R. (1983). *Geology of the Indian Ocean*. Hartford, CT: University of Hartford Press.

Hesen, J., Carpenter, K., Moriber, H., & Milsop, A. (1983). *Computers in the business world*. Hartford, CT: Capital Press. and so on.

The abbreviation *et al.* is not used in the reference list, regardless of the number of authors, although it can be used in the text citation of material with three to five authors (after the initial citation, when all are listed) and in all parenthetical citations of material with six or more authors.

Web Document on University Program or Department Web Site

Degelman, D., & Harris, M. L. (2000). *APA style essentials*. Retrieved May 18, 2000, from Vanguard University, Department of Psychology Website:
http://www.vanguard.edu/faculty/ddegelman/index.cfm?doc_id=796

Stand-alone Web Document (no date)

Nielsen, M. E. (n.d.). *Notable people in psychology of religion*. Retrieved August 3, 2001, from <http://www.psywww.com/psyrelig/psyrelpr.htm>

Journal Article from Database

Hien, D., & Honeyman, T. (2000). A closer look at the drug abuse-maternal aggression link. *Journal of Interpersonal Violence*, 15, 503-522. Retrieved May 20, 2000, from ProQuest database.

Abstract from Secondary Database

Garrity, K., & Degelman, D. (1990). Effect of server introduction on restaurant tipping. *Journal of Applied Social Psychology*, 20, 168-172. Abstract retrieved July 23, 2001, from PsycINFO database.

Article or Chapter in an Edited Book

Shea, J. D. (1992). Religion and sexual adjustment. In J. F. Schumaker (Ed.), *Religion and mental health* (pp. 70-84). New York: Oxford University Press.

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Running Head: VIDEO-MODELLING AND CHILDREN WITH AUTISM

**Effects of Video-modelling on the Acquisition and Generalisation
of Play Behaviour in Children with Autism**

Claire R. Paterson

**Effects of Video-modelling on the Acquisition and Generalisation
of Play Behaviour in Children with Autism**

Abstract

The present study examined the effects of video-modelling on the acquisition and generalisation of play sequences across various toys in 4 boys with autism. Four separate experiments using a single-case experimental design, with multiple baselines across 3 toys within each participant were used. Two boys were given access to 3 unrelated toys, and two boys were given 3 related toys. Video-modelling procedures with each of the 3 unrelated toys resulted in increased levels of verbal and motor play behaviour across both boys. Increases in verbal and motor play with the first related toy generalised across to the other 2 related toys for both boys. Levels of repetitive play also decreased during video intervention for both related and unrelated toys. Treatment effects were maintained during 1-week follow-up. Results suggest video-modelling was an effective method of increasing and generalising verbal and motor play behaviour, and, decreasing repetitive play across all 4 boys.

Author: Claire Paterson
Supervisor: Dr Lu Arco
Submitted: October 2004

**Effects of Video-modelling on the Acquisition and Generalisation
of Play Behaviour in Children with Autism**

A great deal of research has focused on exploring procedures for teaching children diagnosed with Autism Spectrum Disorder. Children with autism show impaired ability in joint attention concerning various social behaviours including play, initiating conversations and responding to social initiations by others (American Psychiatric Association, 2000). These characteristic social deficits may be the most significant impairment faced by children with autism (Koegel, Koegel, Hurley, & Frea, 1992). Several studies have examined the efficacy of using video-modelling for teaching children with autism new behaviours or to alter existing behaviours (Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; D'Ateno, Mangiapanello, & Taylor, 2003; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Nikopoulos & Keenan, 2003). Video-modelling is defined as instances of an individual viewing video footage of a model performing specific behaviour for the observer to imitate (D'Ateno et al., 2003; Nikopoulos & Keenan, 2003).

Video-modelling procedures have been used to effectively teach children with autism a range of social skills including purchasing skills (Alcantara, 1994; Haring et al., 1987), conversation skills (Charlop & Milstein, 1989), and perspective-taking skills (Charlop-Christy & Daneshvar, 2003; LeBlanc et al., 2003). Video-modelling has also been used to address the characteristic deficiencies in play behaviours in children with autism. While in free-play settings children diagnosed with autism typically exhibit deficits in play behaviour and often engage in ritualistic and repetitive behaviour (American Psychiatric Association, 2000). Children with autism experience difficulties in both initiating and performing complex social behaviours associated with play behaviour (Pierce & Schreibman, 1995). Typically-developing children learn social skills

(e.g., sharing and turn-taking), social language, social roles and develop self-esteem and friendships through play (Rutherford & Rogers, 2003; Wolfberg & Schuler, 1993).

Therefore play is an integral part of child development, and has thus been the target of early intervention with children with autism.

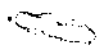
Research investigating the use of video-modelling procedures and play-related behaviour in children with autism is limited. Of the studies that have been conducted much of the focus has been on verbal play behaviours such as scripted conversations about toys (Charlop & Milstein, 1989), play-related comments (Taylor, Levin, & Jasper, 1999), and social initiation in play contexts (Nikopoulus & Keenan, 2003, 2004).

Conversation skills have been effectively taught to children with autism by video-modelling. Charlop and Milstein (1989) increased the level of correct responding to questions about particular toys in three young children with autism through video-modelling procedures. Correct responding generalised across novel topics of conversation, people, and toys. Support was found for the use of video-modelling to teach scripted conversation skills.

Taylor et al. (1999) used video-modelling procedures to teach two young boys with autism to make play-related comments (e.g., "This car goes fast") towards their siblings. The number of play statements made by the boys increased substantially during the video intervention, however with one of the boys the video-modelling sequence was divided into segments, and the number of segments viewed were gradually increased until the entire video sequence was viewed. Although the study by Taylor and colleagues provided support for using video-modelling for teaching play-related verbal behaviour, the long sequence of verbal behaviour needed to be broken down into segments for learning to occur with one child, and may have facilitated novel responding with that particular child. Generalisation across novel people or toys was not examined.

Similar positive behaviour change achieved through video-modelling was found by Nikopoulus and Keenan (2003) who demonstrated decreased latency to social initiation (e.g., initiating play with the experimenter), and, increased time spent in appropriate play in developmentally delayed children. However, results were variable and positive behaviour change was observed in only four of the seven participating children. In addition, although total time spent engaging in appropriate play with the experimenter was measured, it is unclear whether the experimenter modelled the appropriate toy play during the interactive play. Increases in time spent in appropriate play engagement generalised across settings, peers, and toys.

Video-modelling procedures have also been used to increase play behaviour with specific toys. Charlop-Christy et al. (2000) found video-modelling led to faster acquisition of language tasks and toy play in children with autism in comparison to in vivo modelling. Generalisation of play behaviour was found across new versions of the same tasks. However toy play was in terms of a colouring task and a game, and no measures for verbal play behaviour were included. When engaging in toy play children typically display both verbal and motor play behaviour. To date, only one study investigating play behaviour and video-modelling with children with autism has included measures for both verbal and motor play behaviour. D'Ateno et al. (2003) found rapid acquisition of both verbal and motor play behaviour in a young girl with autism following introduction of a video-modelling intervention. However, it is unclear whether gains in play behaviour would have been maintained on removal of the video-modelling intervention. Furthermore, it is unknown whether behaviour change would have transferred to other toys, as no generalisation measures were employed. In addition, D'Ateno and colleagues proposed that measures employed were not sensitive to the characteristic patterns of repetitive behaviour in children with autism, and possible



negative outcomes (e.g., use of modelled responses in a noncontextual or repetitive manner) may have been masked.

Generalisation has been found difficult to achieve for behaviours taught to children with autism by traditional procedures, such as trial and error and prompting (Charlop-Christy et al., 2000; Pierce & Schreibman, 1995). Although previous studies have found video-modelling an effective method to promote generalisation of target behaviour across people, settings, and responses such as unscripted play comments, (Alcantara, 1994; Charlop & Milstein, 1989; Haring et al., 1987; Nikopoulos & Keenan, 2003; Taylor et al., 1999), research examining video-modelling procedures and play behaviour with toys in children with autism has not specifically addressed generalisation (D'Ateno et al., 2003).

The aim of this study was to examine the effects of video-modelling on the acquisition of play behaviour and generalisation across various toys in children with autism. Two research questions were under investigation. First, is video-modelling an effective method of teaching play behaviour to children with autism? Second, is video-modelling an effective method of generalising play behaviour across various toys? This study aimed to extend current video-modelling literature by specifically addressing generalisation across two categories of toys – those that are related (e.g., a crane, a bulldozer, and a dump truck) and those that are unrelated (e.g. a bulldozer, a helicopter, and a jet ski). Currently, no published studies have shown generalisation across unrelated toys and such an observation would be unlikely. Although no previous research has addressed generalisation across toys in terms of both verbal and motor play behaviour, video-modelling has been shown to promote generalisation of target behaviour (Charlop-Christy et al., 2000; Taylor et al., 1999). Therefore, generalisation of play behaviour across related toys was anticipated. Measures employed for this study included

percentage of observation intervals engaged in appropriate verbal and motor play behaviour, and, the percentage of observation intervals engaged in repetitive play behaviour.

Method

Participants

Four boys diagnosed with autism, aged 6 to 9 years, participated in the study. The children attended a suburban primary school and were integrated into regular classrooms. Parents were provided with information sheets and informed consent was received for each child's participation (Appendix A). Names of participants presented in the current study are fictional. Basic nonverbal imitation skills were possessed by all the children. All children watched television at home, and could attend to television footage for at least 90 seconds. Craig was a nonverbal 6-year-old boy in pre-primary. He possessed very limited appropriate toy play skills and engaged in self-stimulatory behaviour (e.g., mouthing and stroking toys) while in free-play settings. Craig's play repertoire consisted of making tunnels from available items (e.g., building blocks, sheets of material) and pushing cars through the tunnel. Craig used picture exchange to communicate with teachers and his receptive language was limited to very simple instructions, consisting of only a few words. Craig did not interact with the other children in play settings and a teacher's assistant was assigned to him during all class and free-time activities.

Luke was a 7-year-old high-functioning boy in the second year of primary school. Luke's verbal expression was well-developed and he spoke fluently, however his verbal comprehension skills were not as strong as his verbal expression. Luke sometimes required assistance in following verbal instruction, and social scripts or stories were used in the classroom to aid his understanding. Luke's social interaction with other children was limited, however he displayed a basic level of social and emotional reciprocity. Luke

possessed a limited play repertoire with some transport toys such as cars and trucks, mostly engaging in stereotyped and repetitive motor behaviour with the wheels.

Ryan was a 9-year-old relatively high-functioning boy in the third year of primary school. Ryan possessed good verbal comprehension, and although he could speak quite fluently, his speech was slow and exaggerated in pace. Ryan's eye contact was limited and his speech was often not directed to another person, particularly when talking about his obsessions (e.g., sharks and trains). Ryan engaged in stereotyped, restricted, and repetitive patterns of behaviour while in free-play settings, and, lacked social or emotional reciprocity. His interaction with other children was very limited, and a teacher's assistant was assigned to help him during all class activities.

John was a 6-year-old high-functioning boy in pre-primary. John possessed a basic and repetitive play repertoire with a range of toys including trains, dinosaurs and cars. John often engaged in restricted, stereotypic patterns of motor play such as spinning wheels on cars. John's verbal expression and comprehension were well-developed and he did not require one-on-one assistance for all class activities. John desired to interact with other children in his class but had difficulty relating to them, and therefore often played with teachers and assistants.

Setting

The study was conducted at a suburban primary school located in Perth, Western Australia. All sessions were conducted in an office located in the school's special education centre (approximately 6 × 3m), unfamiliar to the children. A television and video cassette player were located in the corner of the room throughout the entire study. The room also contained several desks, chairs, bookcases, and a computer.

Materials

Toys. The range of toys included in the unrelated toys category were a construction site, a helicopter play set, and a jetski and accessories (Appendix C). The related toys included a crane, a bulldozer and a dump truck (Appendix D). A play mat and accessories were present across all three of the related toys.

Videotapes. Seven videotapes were included in the study. A young male adult model was used throughout all the video footage. Previous research has suggested that children with autism can learn equally well from both child and adult models (Ihrig & Wolchik, 1988). Each video was approximately 120 seconds in duration. The video footage consisted of the model acting out both verbal and motor play behaviour with the toys (Appendix E). Normative samples of play behaviour was observed prior to filming the video footage by having two typically-developing boys, aged 5 and 7 years, play with the toys. Different play footage was filmed for Craig and Luke, with six different videotapes. Verbal play behaviour was simplified for Craig's videotapes. The same footage of the first toy from the related toys category was viewed by both Ryan and John.

Measurement

Scoring. Appropriate and repetitive verbal and motor play behaviour was recorded using a 10-second partial interval scoring method. A minidisc walkman was played during the sessions to signal each 10-second interval. A tally-sheet was used to record a mark at each interval where one or more incidents of appropriate verbal or motor play behaviour occurred and also whether the behaviour was a repetition of previously recorded play behaviour (Appendix F).

The percentage of intervals of appropriate verbal and motor behaviour and percentage of intervals of repetitive verbal and motor behaviour served as dependent measures.

Appropriate verbal play behaviour was defined as a verbal statement or play noise that was contextually related to both the toy and the situation. For example, the statement "Stop at the lights" or play noise "brm brm" while driving the toy truck along the floor would be recorded as occurrence of appropriate verbal behaviour during the observation interval. However, the occurrence of verbal statements or play noise in the absence of contextually related motor play behaviour, such as talking about objects not in view or unrelated to play context (e.g., talking about sharks while playing with a truck on a road), or, making sounds with no corresponding motor play (e.g., making crashing sounds or fire engine siren sounds while engaged in no corresponding motor play behaviour during or immediately following the sounds) was not recorded as appropriate verbal play. There was no minimum word length for appropriate verbal behaviour and duration of the verbal behaviour was not required to last the entire 10 s observation interval (e.g. occurrence of verbal behaviour would be recorded for a 10 s interval in which the child was silent apart from one verbal statement).

Appropriate motor play behaviour was defined as a motor behaviour or play action that was contextually related to both the toy and the situation. For example, putting a man figurine inside the truck or spinning the propeller blades on a helicopter was considered appropriate motor behaviour. Whereas, mouthing a toy or dangling a toy truck in the air was not recorded as appropriate motor behaviour. The duration of the motor behaviour was not required to last the entire 10 s observation interval (e.g. occurrence of motor behaviour would be recorded for a 10 s interval in which the child performed one play action, such as walking a man figurine).

Repetitive verbal play behaviour was defined as a verbal statement or play noise that was identical to a verbal statement or play noise previously recorded as appropriate during any one 3-minute play session. For example, making a man figurine walk with the

statement “walk walk” was recorded as appropriate verbal play during the first occurrence during any 3-minute play session. Subsequent occurrences of the man walking and the statement “walk walk” for the entire 10 s observation interval were recorded as repetitive verbal behaviour. However, verbal behaviour was not considered a repetition if during the same 10 s interval different verbal behaviour occurred (e.g., during the same interval “walk walk” and “get in the truck”). Verbal behaviour was considered different if the wording was altered in relation to the articles of speech or object label. For example “walk to the truck” and “walk to the house” would be recorded as two different verbal statements.

Repetitive motor play behaviour was defined as motor behaviour or play action that was identical to motor behaviour previously recorded as appropriate during any one 3-minute play session. For example, making a man figurine walk with the statement “walk walk” was recorded as appropriate motor play behaviour during the first occurrence during any 3-minute play session. Subsequent occurrences of the man walking and the statement “go for walk” for the entire 10 s observation interval were recorded as repetitive motor behaviour.

However, motor behaviour was not considered a repetition if during the same 10 s interval different motor behaviour occurred (e.g., during the same interval making the man figurine walk and then get into the truck). Motor behaviour was considered different if the outcome on the environment was different from previously recorded appropriate motor behaviour. For example walking the man figurine over to the truck and walking the man figurine over to the house would be recorded as two different occurrences of motor behaviour.

Observer Training and Interobserver Agreement. Observer training involved reading behavioural definitions for dependent measures and role playing. In addition,

three 20-minute observer training sessions were conducted with each child before commencing experimental sessions. In total, duration of observer training was approximately six hours spaced over three days. During co-observation, both observers were seated the same distance from the children and simultaneously made independent recordings on individual tally-sheets. A second observer was present during a minimum of 25% of sessions for each condition with each child.

Interobserver agreement was calculated by dividing the total number of observer agreements by the total number of agreements plus disagreements and multiplying by 100%. Average agreement for appropriate verbal play behaviour (excluding Craig as he was nonverbal and no verbal measures were included) across children was 94% (range 89-100%) and 97% (range = 94-100%) for repetitive verbal play behaviour. Average agreement for appropriate motor play behaviour 97% (range = 92-100%) and 98% (range = 94-100%) for repetitive motor play behaviour. Means and ranges for interobserver agreement with each individual child are shown in Table 1.

Research Design

Four separate experiments using a single-case experimental design, with multiple baselines across three toys with each child was used to collect data. Craig and Luke were allocated related toys (e.g., a crane and a bulldozer) and Ryan and John were allocated unrelated toys (e.g., a helicopter and a jet ski). The rationale for allocating two categories of toys was the following. If the boys given unrelated toys experienced increases in play behaviour with the first toy, during video-modelling with the first toy, and no increase in baseline play behaviour across the second and third toys, it is possible to suggest that the toys were unrelated and no transfer of learning was experienced. If the boys given related toys experienced increases in play behaviour with the first toy, during video-modelling with the first toy, and an increase in baseline play behaviour across the second

and third toys, most likely, generalisation of behaviour learned from video-modelling procedures would have occurred. One to two sessions were conducted each school day.

Procedure

Information regarding toy preferences and play behaviour was obtained from parents and teachers for each child prior to commencement of the study. In addition, before the first experimental session the experimenter spent time with the children during class activities in order for the children to familiarise themselves with the experimenter. The familiarisation sessions were conducted individually with each child, twice in their respective classrooms, and once in the room in which the study was conducted. The second observer was also present for two of the familiarisation sessions.

Baseline. During baseline sessions the boys were verbally instructed to "Play with the ____ [bulldozer / helicopter etc]". Baseline sessions for each of the three toys were conducted sequentially, with 3 minute duration for each individual toy baseline. After completion of one 3-minute play session the toys were removed and replaced with the next toys. At the beginning of each session the toys were arranged in the same order and location on the floor in the middle of the room. Baselines for all three toys were conducted during each session. The session was terminated if the boys left the play area for more than 40 seconds. No reinforcement, prompting or correction procedures were used during baseline sessions.

Video-modelling intervention. At the beginning of each session the experimenter instructed "Let's watch a video." During video-modelling sessions the child sat on a chair next to the experimenter, facing the television (approximately at a distance of 2.5 m from the television). The experimenter modelled watching the television when the video-modelling tape was played, and, provided a prompt (e.g., pointing at the television) if the child withdrew attention for more than 5 seconds. Each child viewed the video-modelling

footage twice, followed by immediate access to the toy shown in the footage. The presentation of toys occurred as in baseline sessions. If the boys left the play area for more than 40 seconds (two consecutive observation intervals), the experimenter redirected the boys towards the toys and repeated the verbal instruction "Play with the ____ [bulldozer / helicopter etc]". During the 3-minute play session with each toy, experimenter offered verbal praise such as "That was great playing" when the child engaged in appropriate play behaviour. Verbal praise was offered no more than once with each toy per session.

Video-modelling procedures for toy 2 and toy 3 for both related and unrelated toys were only provided if there was no substantial behaviour change (i.e., no indication of generalisation of play behaviour) observed during baseline for both toy 2 and toy 3.

Reversal and Follow-up. Reversal and follow-up sessions were conducted in the same manner as baseline sessions. The follow-up sessions for Craig, Luke, and John were conducted following seven days without play sessions.

Results

Unrelated toy play behaviour

Figure 1 displays percentage of intervals of appropriate motor play behaviour across conditions and all three unrelated toys and for Craig. During baseline Craig engaged in low and relatively stable levels of motor play behaviour with toy 1 ($M = 30\%$, range = 22–33%) and toy 2 ($M = 28\%$, range = 11–33%). However, with toy 3 there appeared a slightly increasing trend in motor play behaviour ($M = 26\%$, range = 11–44%).

Craig demonstrated increases in motor play behaviour across all three toys following implementation of the video-modelling intervention for each individual toy. During video-modelling intervention with toy 1 there was a dramatic increase in motor

play behaviour from low baseline levels to 77% in session 5, followed by a variable but increasing trend which levelled at 100% ($M = 82\%$, range = 55–100%).

During video-modelling with toy 2, there was a variable but increasing trend which reached levels of motor play behaviour with toy 2 substantially higher than baseline levels ($M = 70\%$, range = 44–100%). Similarly, with toy 3, there was an increasing trend with low variability in motor play behaviour, which reached levels higher than baseline ($M = 67\%$, range = 55–77%). Behaviour was maintained during reversal with toy 1 ($M = 98\%$, range = 88–100%). During 1-week follow-up behaviour appeared to have been maintained. Follow-up levels of motor play behaviour were considerably higher than baseline levels across toy 1 ($M = 100\%$, range = 100–100%), toy 2 ($M = 74\%$, range = 66–77%), and toy 3 ($M = 60\%$, range = 55–66%).

Figure 2 displays percentage of intervals of repetitive motor play behaviour across conditions and all three unrelated toys and for Craig. Repetitive motor behaviour decreased over the duration of the study across all three toys. Baseline levels of repetitive motor behaviour were high and variable for toy 1 ($M = 61\%$, range = 55–66%), toy 2 ($M = 65\%$, range = 44–88%), and toy 3 ($M = 61\%$, range = 22–77%). During video-modelling, there was a variable but decreasing trend in repetitive motor behaviour which reached substantially lower levels than those observed during baseline for toy 1 ($M = 13\%$, range = 0–44%), toy 2 ($M = 28\%$, range = 0–55), and toy 3 ($M = 32\%$, range = 22–44%).

During both reversal and the 1-week follow-up repetitive motor behaviour was maintained at 0% with toy 1. During follow-up there was low variability in levels repetitive motor behaviour for toy 2 ($M = 19\%$, range = 11–22%), and toy 3 ($M = 17\%$, range = 11–22%). Repetitive motor behaviour was considerably lower during follow-up than baseline across all three toys.

Figure 3 displays percentage of intervals of appropriate verbal and motor play behaviour across conditions and all three unrelated toys and for Luke. During baseline with toy 1, Luke engaged in considerably low stable levels of verbal play behaviour ($M = 8\%$, range = 0-11%), and low and reasonably stable levels of motor play behaviour ($M = 39\%$, range = 33-44%). Baseline levels of verbal and motor play behaviour were low and variable for both toy 2 ($M = 19\%$, range = 0-44%, $M = 38\%$, range = 22-44%, respectively) and toy 3 ($M = 40\%$, range = 11-66%, $M = 33\%$, range = 11-55%, respectively).

Luke demonstrated increases in verbal and motor play behaviour across all three toys following implementation of the video-modelling with each individual toy. In the first session of video-modelling for toy 1 there was a dramatic increase in verbal play behaviour from low baseline levels, followed by an increasing trend to session 10, after which levels maintained at 100% ($M = 77\%$, range = 44-100%). Similarly, in the first video-modelling session for toy 1 levels of motor play behaviour increased dramatically to 100%, followed by a drop in levels in session 6 and an increasing trend until session 9, after which levels maintained at 100% ($M = 91\%$, range = 55-100%).

During video-modelling with toy 2, there was a dramatic increase in both verbal and motor behaviour from baseline levels, and an increasing trend which reached 100% ($M = 86\%$, range = 77-100%, $M = 87\%$, range = 77-100%, respectively). Similarly, during video-modelling with toy 3, both verbal and motor play behaviour increased dramatically (to 88% and 100%, respectively). However, verbal play behaviour with toy 3 dropped in the second video-modelling session (session 18), after which there was an increasing trend that reached 100% ($M = 90\%$, range = 77-100%). Motor play behaviour during video-modelling with toy 3 was slightly variable, with a drop in levels during sessions 19 and 20, after which levels returned to 100% ($M = 96\%$, range = 88-100%).

During reversal with toy 1, play behaviour was variable and slightly lower than during video-modelling, however levels remained substantially higher than those observed in baseline for both verbal and motor play behaviour ($M = 85\%$, range = 77-100%, $M = 89\%$, range = 77-100%, respectively). During 1-week follow-up behaviour appeared to have been maintained. Follow-up levels of both verbal and motor play behaviour were variable, but considerably higher than baseline levels across toy 1 ($M = 86\%$, range = 77-100%, $M = 88\%$, range = 77-100%, respectively), toy 2 ($M = 66\%$, range = 55-77%, $M = 83\%$, range = 66-88%, respectively) and toy 3 ($M = 83\%$, range = 66-88%, $M = 74\%$, range = 66-77%, respectively).

Figure 4 displays percentage of intervals of repetitive verbal and motor play behaviour across conditions and all three unrelated toys and for Luke. During baseline with toy 1, repetitive verbal behaviour was high in the first baseline session, after which levels dropped to 0% ($M = 17\%$, range = 0-66%). Baseline levels of repetitive motor behaviour with toy 1 were high and relatively stable ($M = 58\%$, range = 55-66%). During baseline with toy 2, repetitive verbal behaviour remained at 0% until levels increased to 22% in session 9, after which levels remained low and variable ($M = 4\%$, range = 0-22%). Baseline levels of repetitive motor behaviour with toy 2 were high and relatively stable until a drop in levels in session 9, after which levels remained high and variable ($M = 59\%$, range = 44-77%). During baseline with toy 3, both repetitive verbal and motor behaviour were high and variable ($M = 32\%$, range = 0-55%, $M = 52\%$, range = 22-77%, respectively), with a slight decreasing trend in repetitive behaviour during sessions 4 to 6, followed by a variable increasing trend.

Luke demonstrated decreases in repetitive verbal and motor play behaviour across all three toys following implementation of video-modelling with each individual toy. During the first video-modelling session both repetitive verbal and motor behaviour with

toy 1 dramatically decreased to 0%, followed by an increase in session 6, after which there was a variable decreasing trend that reached 0% for both repetitive motor and verbal behaviour ($M = 6\%$, range = 0-22%, $M = 8\%$, range = 0-44%, respectively).

During video-modelling, levels of repetitive verbal and motor behaviour with toy 2 and toy 3 were low, and following session 19 there was a decreasing trend in repetitive verbal and motor behaviour which reached 0% with both toy 2 ($M = 12\%$, range = 0-22%, $M = 12\%$, range = 0-22%, respectively) and toy 3 ($M = 6\%$, range = 0-11%, $M = 2\%$, range = 0-11%, respectively). During reversal with toy 1, levels of repetitive behaviour remained low, with a decreasing trend in repetitive verbal behaviour ($M = 9\%$, range = 0-22%), and low variability in repetitive motor behaviour ($M = 8\%$, range = 0-22%).

During 1-week follow-up decreases in repetitive behaviour appeared to have been maintained across all three toys. Levels of repetitive verbal behaviour remained low for toy 1 ($M = 8\%$, range = 0-22%) and toy 3 ($M = 11\%$, range = 0-22%), and at 0% for toy 2. Similarly, repetitive motor behaviour appeared to have been maintained below baseline levels for toy 1 ($M = 6\%$, range = 0-11%), toy 2 ($M = 11\%$, range = 0-33%), and toy 3 ($M = 25\%$, range = 22-33%).

Related toy play behaviour

Figure 5 displays percentage of intervals of appropriate verbal and motor play behaviour across conditions and all three related toys for Ryan. During baseline with toy 1, Ryan displayed low levels of verbal and motor play behaviour ($M = 6\%$, range = 0-22%, $M = 28\%$, range = 11-33%, respectively). In the first session of video-modelling for toy 1 there was a dramatic increase in both verbal and motor play behaviour to 100%. However, the following 3 sessions showed 0% for verbal play behaviour and baseline levels for motor play behaviour, after which levels returned to 100% for both verbal and

motor play behaviour ($M = 57\%$, range = 0-100%, $M = 74\%$, range = 33-100%, respectively).

During reversal increases in both verbal and motor play behaviour with toy 1 were not maintained, with a decreasing trend in play behaviour to session 22, after which there appeared an increasing trend to levels above those observed in baseline for both verbal and motor play behaviour ($M = 52\%$, range = 11-100%, $M = 59\%$, range = 33-100%, respectively). Following reintroduction of video-modelling both verbal and motor play behaviour increased to levels observed in the first phase of video-modelling ($M = 89\%$, range = 66-100%, $M = 91\%$, range = 77-100%, respectively).

Similar changes in play behaviour to those observed with toy 1 were seen across toy 2 and toy 3, however no video-modelling was conducted with toy 2 or toy 3, and baseline conditions were held constant throughout study duration. During the first four baseline sessions both verbal and motor play behaviour remained low with toy 2 ($M = 11\%$, range = 0-22%, $M = 30\%$, range = 22-33%, respectively), and toy 3 ($M = 3\%$, range = 0-11%, $M = 22\%$, range = 11-33%, respectively). In session five levels of verbal and motor play behaviour increased dramatically to 100% for both toy 2 and toy 3. However, during sessions 6 and 7 levels returned to low levels observed during the first four baseline sessions. In session eight, levels of verbal and motor play behaviour returned to 100% for both toy 2 and toy 3, and remained at high levels during sessions 8 to 11. During sessions 5 to 11 changes in verbal and motor play behaviour with toy 2 ($M = 71\%$, range = 0-100%, $M = 79\%$, range = 33-100%, respectively) and toy 3 ($M = 71\%$, range = 0-100%, $M = 78\%$, range = 22-100%, respectively) were similar to those observed with toy 1 during video-modelling.

Increases in both verbal and motor play behaviour for toy 2 and toy 3 were not maintained and there was a decreasing trend in play behaviour during session 12 to 17,

followed by low levels of motor play behaviour and variable levels of verbal play behaviour. During sessions 12 to 24 changes in verbal and motor play behaviour with toy 2 ($M = 48\%$, range = 0-100%, $M = 50\%$, range = 33-100%, respectively) and toy 3 ($M = 47\%$, range = 0-100%, $M = 58\%$, range = 33-100%, respectively) were similar to those observed with toy 1 during reversal. During sessions 25 to 28 there was an increasing trend in both verbal and motor play behaviour with toy 2 ($M = 80\%$, range = 66-100%, $M = 86\%$, range = 77-100%, respectively) and toy 3 ($M = 77\%$, range = 66-100%, $M = 77\%$, range = 66-100%, respectively), which reached 100% with both toys.

Figure 6 displays percentage of intervals of repetitive verbal and motor play across conditions and all three related toys and for Ryan. Levels of repetitive verbal behaviour remained reasonably low throughout the study duration for Ryan. During baseline with toy 1 repetitive verbal behaviour was low and stable ($M = 3\%$, range = 0-11%), while there was a downward trend in repetitive motor behaviour ($M = 50\%$, range = 33-66%). In the first session of video-modelling with toy 1, repetitive verbal behaviour remained at 0%, and there was a dramatic decrease in repetitive motor behaviour to 0%. Repetitive verbal behaviour remained at 0% throughout the video-modelling. Conversely, during video-modelling with toy 1 there was an increase in repetitive motor behaviour to baseline levels during sessions 6 to 9, after which levels dropped to 0% ($M = 22\%$, range = 0-55%).

During reversal with toy 1, decreases in both repetitive play behaviour were not maintained, with an increasing trend in repetitive behaviour until session 17, after which there appeared a decreasing trend that reached 0% for both repetitive verbal and motor play behaviour ($M = 6\%$, range = 0-33%, $M = 11\%$, range = 0-44%, respectively). Following reintroduction of video-modelling with toy 1, repetitive verbal play behaviour

remained 0%, while repetitive motor play behaviour was low and stable at levels considerably lower than those observed during baseline ($M = 3\%$, range = 0-11%).

Similar changes in repetitive play behaviour occurred across toy 2 and toy 3, although no video-modelling was conducted with toy 2 or toy 3. During the first four baseline sessions with toy 2 and toy 3 repetitive verbal behaviour was 0% and levels of repetitive motor behaviour were moderately high and variable with both toy 2 ($M = 38\%$, range = 11-77%) and toy 3 ($M = 30\%$, range = 22-44%).

During sessions 5 to 11, repetitive verbal play behaviour remained at 0% across toy 2 and toy 3. In session five levels of repetitive motor play behaviour decreased to 0% with both toy 2 and toy 3. However, during sessions 6 and 7 there was a dramatic increase in repetitive motor behaviour, followed by a sharp drop to 0% in session eight for both toy 2 and toy 3. Levels remained low during sessions 8 to 11. During sessions 5 to 11 changes in repetitive verbal and motor play behaviour with toy 2 ($M = 16\%$, range = 0-55%) and toy 3 ($M = 21\%$, range = 0-66%) were similar to those observed with toy 1 during video-modelling.

During sessions 12 to 17 there was a variable increase in repetitive verbal and motor play behaviour, after which there appeared to be a decreasing trend that reached 0% for both repetitive verbal and motor play behaviour. During sessions 12 to 24 changes in verbal and motor play behaviour with toy 2 ($M = 17\%$, range = 0-55%, $M = 18\%$, range = 0-66%, respectively) and toy 3 ($M = 12\%$, range = 0-44%, $M = 14\%$, range = 0-44%, respectively) were similar to those observed with toy 1 during reversal. During sessions 25 to 28 levels of repetitive verbal and motor play behaviour remained low and relatively stable with toy 2 ($M = 6\%$, range = 0-22%, $M = 6\%$, range = 0-22%, respectively), and were maintained at 0% with toy 3.

Figure 7 displays percentage of intervals of appropriate verbal and motor play behaviour across conditions and all three related toys for John. During baseline John displayed low levels of verbal and motor play behaviour with toy 1 ($M = 17\%$, range = 0-33%, $M = 28\%$, range = 22-33%, respectively). Following implementation of video-modelling with toy 1, both verbal and motor play behaviour increased dramatically to 100%, which was maintained during the video-modelling phase. Behaviour was not maintained during reversal, and there was a decreasing trend in both verbal and motor play behaviour with toy 1 ($M = 70\%$, range = 44-100%, $M = 77\%$, range = 55-100%, respectively). During reintroduction of video-modelling, both verbal and motor play behaviour with toy 1 increased substantially to levels observed in the first phase of video modelling ($M = 95\%$, range = 77-100%, and $M = 98\%$, range = 88-100%, respectively). During 1-week follow-up with toy 1, levels of verbal and motor play behaviour were variable, however levels were maintained considerably higher than those observed during baseline ($M = 63\%$, range = 55-77%, and $M = 80\%$, range = 44-100%, respectively).

Similar changes in play behaviour to those observed with toy 1 were seen across toy 2 and toy 3, however no video-modelling was conducted with toy 2 or toy 3. During the first four baseline sessions both verbal and motor play behaviour were low and stable with toy 2 ($M = 11\%$, range = 11-11%, and $M = 28\%$, range = 22-33%, respectively) and toy 3 ($M = 19\%$, range = 11-22%, and $M = 22\%$, range = 22-22%, respectively). In session 5, there was dramatic increase in both verbal and motor play behaviour to 100% with both toy 2 and toy 3. Behaviour was maintained for three sessions, after which there was a slight decrease in both verbal and motor play behaviour with toy 2 and toy 3. During sessions 5 to 8 levels of verbal and motor play behaviour with toy 2 ($M = 97\%$, range = 88-100%, and $M = 97\%$, range = 88-100%, respectively) and toy 3 ($M = 94\%$,

range = 77-100%, and $M = 94\%$, range = 77-100%, respectively) were similar to those observed with toy 1 during video-modelling.

During sessions 9 to 10 there was a slight increase in both verbal and motor play behaviour, followed by a decreasing trend in play behaviour with toy 2 during sessions 11 to 16. Verbal and motor play behaviour during sessions 9 to 16 with toy 2 ($M = 62\%$, range = 44-100%, and $M = 65\%$, range = 44-100%, respectively) and toy 3 ($M = 57\%$, range = 22-100%, and $M = 55\%$, range = 22-100%, respectively) was similar to play behaviour observed with toy 1 during reversal. During sessions 17 to 21 levels of verbal and motor play behaviour increased substantially with both toy 2 ($M = 98\%$, range = 88-100%, and $M = 98\%$, range = 88-100%, respectively) and toy 3 ($M = 91\%$, range = 66-100%, and $M = 91\%$, range = 66-100%, respectively), which was similar to the increases observed with toy 1 during the second video-modelling phase.

During 1-week follow-up increases in verbal and motor play behaviour were variable, but maintained above levels observed in baseline for toy 2 ($M = 66\%$, range = 55-77%, and $M = 69\%$, range = 55-77%, respectively) and toy 3 ($M = 61\%$, range = 55-77%, and $M = 72\%$, range = 55-88%, respectively).

Figure 8 displays percentage of intervals of repetitive verbal and motor play behaviour across conditions and all three related toys and for John. Decreases in the levels of repetitive verbal and motor play behaviour occurred across all three toys throughout the study duration for John. During baseline with toy 1, John displayed low variable levels of repetitive verbal play behaviour ($M = 17\%$, range = 0-33%), and high levels of repetitive motor play behaviour ($M = 69\%$, range = 66-77%). Following introduction of video-modelling with toy 1, repetitive verbal and motor behaviour decreased dramatically to 0% and remained at 0% during the video-modelling phase.

During reversal, decreases in repetitive behaviour with toy 1 were not maintained and there was an increasing trend in repetitive verbal and motor play behaviour ($M = 26\%$, range = 0-55%, and $M = 21\%$, range = 0-44%, respectively). However, during reintroduction of video-modelling levels of repetitive verbal and motor play behaviour decreased to 0% ($M = 4\%$, range = 0-22%, and $M = 2\%$, range = 0-11%). During follow-up with toy 1, levels of repetitive behaviour increased from levels observed during video-modelling, however levels of repetitive verbal and motor behaviour remained lower than those observed during baseline ($M = 28\%$, range = 22-44%, and $M = 8\%$, range = 0-22%, respectively).

Similar changes in repetitive behaviour to those observed with toy 1 were seen across toy 2 and toy 3, however no video-modelling was conducted with toy 2 or toy 3. During the first four baseline sessions, levels of repetitive verbal and motor play behaviour were considerably high and variable for both toy 2 ($M = 22\%$, range = 11-44%, and $M = 47\%$, range = 11-66%, respectively) and toy 3 ($M = 39\%$, range = 11-55%, and $M = 63\%$, range = 33-77%, respectively). During sessions 5 to 8, levels of repetitive verbal and motor behaviour dramatically decreased to 0%, which was maintained until session 8 during which there was a slight increase in repetitive verbal and motor behaviour for both: toy 2 ($M = 3\%$, range = 0-11%, and $M = 3\%$, range = 0-11%, respectively) and toy 3 ($M = 6\%$, range = 0-22%, and $M = 6\%$, range = 0-22%, respectively). Decreases in repetitive behaviour were similar to those observed with toy 1 during video-modelling.

During sessions 9 to 16, there was a variable increasing trend in repetitive verbal and motor behaviour with both toy 2 ($M = 30\%$, range = 0-55%, and $M = 28\%$, range = 0-55%, respectively) and toy 3 ($M = 40\%$, range = 0-77%, and $M = 41\%$, range = 0-77%, respectively), similar to the increases in repetitive behaviour observed with toy 1 during

reversal. During sessions 17 to 21, repetitive behaviour substantially decreased to low levels of repetitive verbal and motor behaviour for toy 2 ($M = 2\%$, range = 0-11%, and $M = 2\%$, range = 0-11%, respectively) and toy 3 ($M = 9\%$, range = 0-33%, and $M = 9\%$, range = 0-33%, respectively). Yet again, decreases in repetitive behaviour were similar to those observed with toy 1 during the second video-modelling phase. During 1-week follow-up levels of repetitive behaviour increased from levels observed during video-modelling, however levels of repetitive verbal and motor behaviour were lower than those observed during the first four baseline sessions for toy 2 ($M = 28\%$, range = 11-44%, and $M = 25\%$, range = 22-33%, respectively) and toy 3 ($M = 25\%$, range = 11-33% and $M = 17\%$, range = 0-33%, respectively).

Discussion

Overall, results of this investigation suggest that video-modelling procedures are effective in teaching verbal and motor play behaviour to children with autism. All four children demonstrated increases in appropriate play behaviour and decreases in repetitive play behaviour during the video-modelling intervention. Generalisation of appropriate play behaviour across toys was found only for the boys who received related toys. Interestingly, during the reversal phase increased levels of appropriate play behaviour were maintained only by the boys who received unrelated toys. During the 1-week follow-up conducted with three of the boys, levels of appropriate play behaviour were maintained above those observed during baseline.

The current findings support those of previous video-modelling research, which has found video-modelling an effective method of teaching children with autism range of play-related behaviours including complex verbal and motor play sequences (D'Ateno et al., 2003), social initiation (Nikopoulos & Keenan, 2003) and toy-related conversation skills (Charlop & Milstein, 1989; Taylor et al., 1999). The present study contributes to a

growing body of literature supporting the use of video-modelling procedures for teaching children with autism, and enhances the literature by specifically addressing generalisation across toys, and, by including measures sensitive to verbal, motor, and repetitive play behaviour.

The promotion of generalisation of play behaviour across related toys is an important finding given the lack of video-modelling research addressing generalisation of toy play behaviour in children with autism. Moreover, anecdotal data suggested generalisation of play behaviour was not simply a substitution of one transport toy (e.g., driving the crane) for another (e.g., driving the bulldozer or dump truck). The video footage of toy 1 viewed by Ryan and John showed the crane picking up and moving the barrel with the hook, and, collecting a second passenger in a second seat amongst other actions. Play behaviour demonstrated by both boys with toy 2 and toy 3 included putting the barrel and the second passenger in the scoop of the bulldozer, and the back of the dump truck. This finding is encouraging given the difficulty in generalising behaviour taught to children with autism by traditional procedures, such as trial and error and prompting (Charlop-Christy et al., 2000; Pierce & Schreibman, 1995).

The lack of generalisation of verbal and motor play behaviour across unrelated toys in the current study was expected, and suggests that the boys most likely viewed the toys to be substantially different from one another, and therefore transfer of play behaviour between toys did not occur. If children consider novel stimuli to be related to stimuli presented in video-modelling footage, they are more likely to imitate the modelled behaviour with the novel stimuli. In the case of the related toys employed in the current study, it would appear that the children perceived the crane (toy 1) to be related to the bulldozer (toy 2) and the dump truck (toy 3). However, it is also possible that the presence of the play mat and peripheral toys prompted imitation of modelled play

behaviour across the three related toys, rather than the perceived relatedness of toy 2 and toy 3 to the first toy. Therefore, it is possible that generalisation may have occurred even if the pertinent toys (e.g., crane, bulldozer, and dump truck) were not viewed as related. Future research investigating generalisation of play behaviour could examine the influence related peripheral toys (e.g., accessory toys) on generalisation of play behaviour across unrelated pertinent toys.

In addition to the differences in generalisation of play behaviour between related and unrelated toys, results were variable between children. Craig and Luke, who both received unrelated toys, experienced a variable increasing trend in appropriate play behaviour during video-modelling, whereas Ryan and John, who both received related toys, demonstrated dramatic increases in appropriate play behaviour (to 100%) in the first video-modelling session. One possible explanation for the difference in response between unrelated and related toys may have been the presence of the play mat across all three related toys. The presence of the play mat may have acted as a visual prompt for the children to remember the play behaviour modelled in the video footage. Indeed, anecdotal data suggested that the boys who were given related toys imitated the modelled play actions and sequences verbatim during the first video-modelling session. Whereas, the boys who received unrelated toys did not imitate the modelled play behaviour as concisely as the boys who were given related toys during the first few video-modelling sessions.

Although both Ryan and John experienced increases in appropriate play behaviour with the related toys, Ryan's behaviour was variable during the video-modelling intervention. Anecdotal data suggested that Ryan's variable response was associated with self-stimulatory behaviour, however this may have been influenced by Ryan's participation in two complete play sessions during each day.

Differences in play behaviour between unrelated and related toys were also found during the reversal phase with the first toys. During the reversal phase, Ryan and John both demonstrated a loss of treatment effect with the related toys, whereas play behaviour remained at video-modelling levels for Craig and Luke with the unrelated toys. Although it is unclear why levels of play behaviour were maintained during reversal only with the unrelated toys, it is possible that concurrent implementation of video-modelling procedures with toy 2 and toy 3 during the reversal phase with the first unrelated toy may have helped to maintain levels of play behaviour. This could possibly be determined if the design implemented with the related toys was replicated with the unrelated toys. By employing only one video-modelling treatment with the first unrelated toy, without the concurrent video-modelling procedures with the second or third toy, the demonstrated levels of play behaviour could be more easily interpreted.

It is also possible that imitation of modelled play behaviour with the unrelated toys was inherently more reinforcing than play behaviour modelled with the related toys. Hence, the motivation to imitate modelled play behaviour with the related toys decreased when the video-modelling was removed. However, the nature of variability in responses is unclear and further investigation is needed to determine the influence of specific target behaviours and observer preferences on maintenance of treatment effect in video-modelling interventions.

During reintroduction of the video-modelling intervention with the two boys who received related toys, levels of appropriate play behaviour increased and repetitive play behaviour decreased across all toys. Unfortunately due to time constraints the duration of the reintroduction of the video-modelling treatment was limited to four sessions with Ryan. Continuation of the second phase of video-modelling would have been preferable given the variability in appropriate play behaviour displayed by Ryan during the first

video-modelling phase. Nonetheless, during the second phase of video-modelling levels of appropriate play behaviour remained high and repetitive behaviour was low, suggesting the video-modelling treatment was effective in producing positive behaviour change with Ryan.

During the 1-week follow-up conducted with three of the boys, increases in appropriate play behaviour were maintained above baseline levels, while decreases in repetitive play behaviour were maintained below baseline levels. However, levels of appropriate play behaviour were not as high as those observed during video-modelling. On-going video-modelling training, or booster sessions may be required to maintain treatment effect over time. Further follow-ups are needed to determine to the extent to which positive behaviour changes are maintained after a greater period of time has elapsed.

All children demonstrated decreases in repetitive play behaviour during video-modelling sessions. Generally, increases in appropriate play behaviour were associated with decreases in repetitive play behaviour. However these decreases varied between verbal and motor repetitive behaviour between, and, within some children. All the boys experienced reductions in repetitive motor behaviour following the implementation of video-modelling, however verbal repetitive behaviour was variable. Although John demonstrated decreases in verbal repetitive behaviour throughout the study, levels remained low during baseline for Luke and Ryan. Anecdotal data suggested that the low levels during baseline were caused by nonverbal play behaviour with Luke, and self-stimulatory behaviour in Ryan, and therefore the boys were not engaged in any form of verbal play behaviour. Future studies need to account for pre-existing levels of verbal behaviour when interpreting the effect of video-modelling on repetitive behaviour.

One of the limitations of the present study is that it was not possible to continue the video-modelling intervention with the second and third unrelated toys for the same duration as with the first toy. Before ending the video-modelling intervention with toy 2 and toy 3 it would have been preferable to allow levels of appropriate play behaviour to stabilize. Similarly, limited time with Ryan did not permit continuation of the reintroduction of the video-modelling until levels were stable, or allow for a follow-up. In addition, conducting two sessions with each child on a single day may have negatively influenced results, and account for some of the variability in play behaviour, particularly with Ryan.

The current findings offer support for the use of video-modelling as a powerful tool for teaching children with autism. There is a range of benefits associated with the use of video-modelling procedures. Video-modelling can be used to target a range of behaviours and employ a variety of models and naturalistic settings difficult to achieve with traditional methods of teaching (Charlop-Christy et al, 2000; Sherer et al., 2001). In addition, video-modelling is a cost-efficient alternative to traditional teaching methods in terms of the cost of training and employing models, and, due to the ability to use video footage repeatedly with a number of children (Charlop-Christy et al, 2000).

The effectiveness of video-modelling as method for teaching target behaviour to children with autism, coupled with the benefits of video-modelling, offer support for implementation of such interventions. Many schools and parents of children with autism do not have the resources to engage in intensive one-on-one therapy throughout the school day. Video-modelling procedures could be used to compliment a child's curriculum, and to focus on areas of difficulty, such basic social skills. In addition, video-modelling could be used for generalisation training with a range of behaviours taught via both traditional methods and video-modelling procedures. Future research is

needed to determine ways video-modelling can be implemented as part of the curriculum of school-aged children with autism. In addition, although anecdotal data from the current study suggested novel appropriate play behaviour (e.g., new appropriate play behaviour not directly imitated from the video-model) occurred during video-modelling sessions, the frequency of novel responding was not recorded. Future studies may therefore wish to include measures for novel responding across all toys. It would also be of interest to examine whether the frequency of sessions across intervention impacts on both the rapidity of learning, and maintenance of behaviour over time.

Results from the current study raised some interesting issues including; increases in appropriate verbal and motor play behaviour across toys for all children, the successful generalisation of newly learned play behaviour across related toys, the absence of generalisation of newly learned play behaviour across unrelated toys, variability in the changes in appropriate and repetitive play behaviour, and individual differences influencing the impact of video-modelling interventions, such as self-stimulatory behaviour. It is also important to note that although positive behaviour changes were observed across all children, changes were variable and therefore the effectiveness of video-modelling procedures for teaching children with autism may vary substantially between children.

The current findings contribute to understanding the mechanisms of video-modelling that produce positive behaviour change in children with autism by specifically addressing generalisation across both related and unrelated toys, and by the inclusion of measures for verbal, motor, and repetitive play behaviour. Overall, the results from this study have demonstrated the effectiveness of video-modelling as a treatment procedure for increasing appropriate play behaviour and decreasing repetitive play behaviour in

children with autism. Moreover, findings suggest that positive changes in play behaviour resulting from video-modelling can generalise to related toys.

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Table 1

Percentage of Occurrence Interobserver Agreement Means and Ranges for Each Child

	Mean	Range
Craig	93	92-94
Luke	99	97-100
Ryan	94	89-97
John	99	97-100

Figure Captions

Figure 1. Percentage of appropriate motor play during baseline, video intervention, reversal, and follow-up across all three toys for Craig.

Figure 2. Percentage of repetitive motor play during baseline, video intervention, reversal, and follow-up across all three toys for Craig.

Figure 3. Percentage of appropriate verbal and motor play during baseline, video intervention, reversal, and follow-up across all three toys for Luke.

Figure 4. Percentage of repetitive verbal and motor play during baseline, video intervention, reversal, and follow-up across all three toys for Luke.

Figure 5. Percentage of appropriate verbal and motor play during baseline, video intervention, reversal, and reintroduction of video intervention across all three toys for Ryan.

Figure 6. Percentage of repetitive verbal and motor play during baseline, video intervention, reversal, and reintroduction of video intervention across all three toys for Ryan.

Figure 7. Percentage of appropriate verbal and motor play during baseline, video intervention, reversal, reintroduction of video intervention, and follow-up across all three toys for John.

Figure 8. Percentage of repetitive verbal and motor play during baseline, video intervention, reversal, reintroduction of video intervention, and follow-up across all three toys for John.

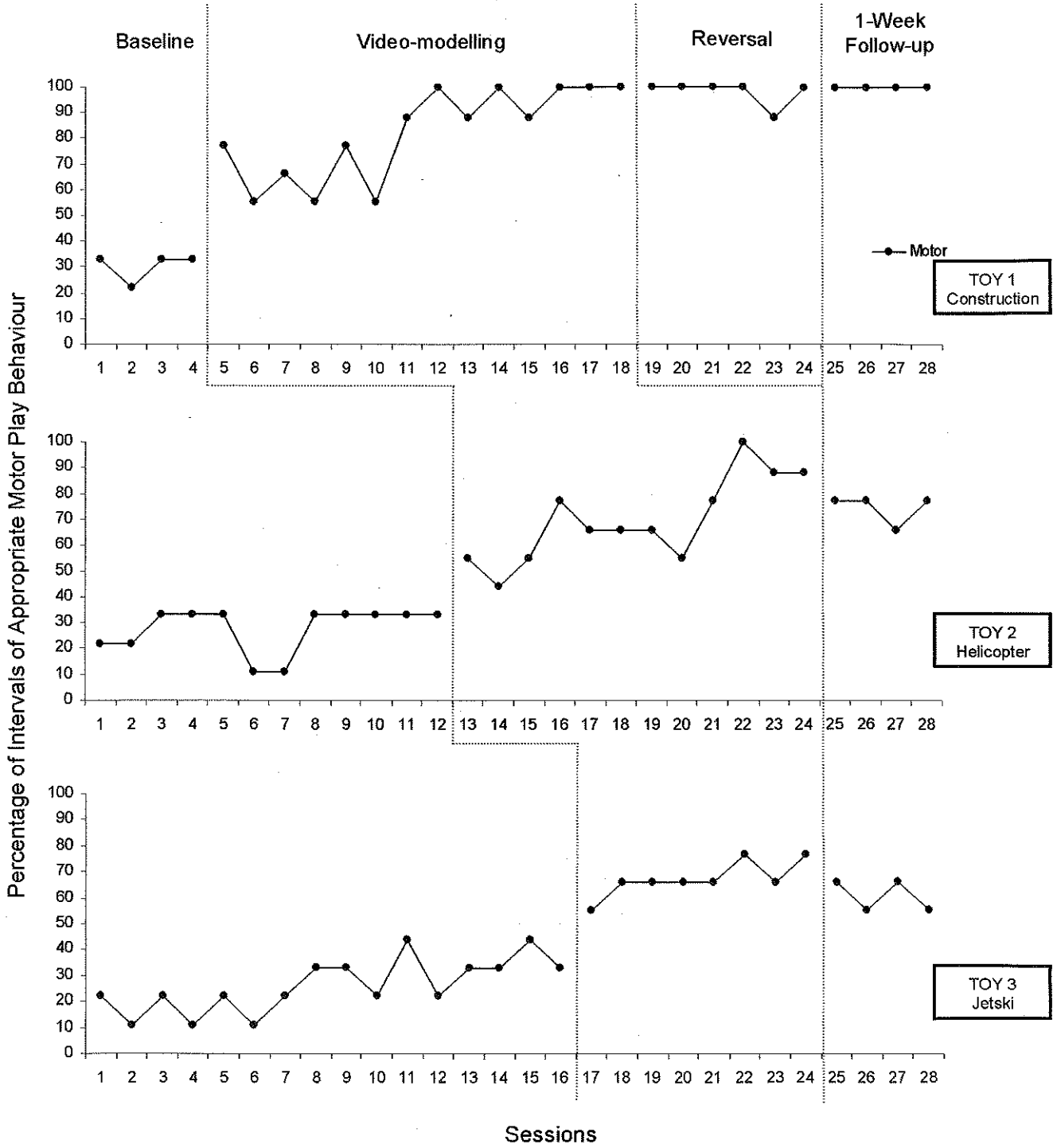


Figure 1.

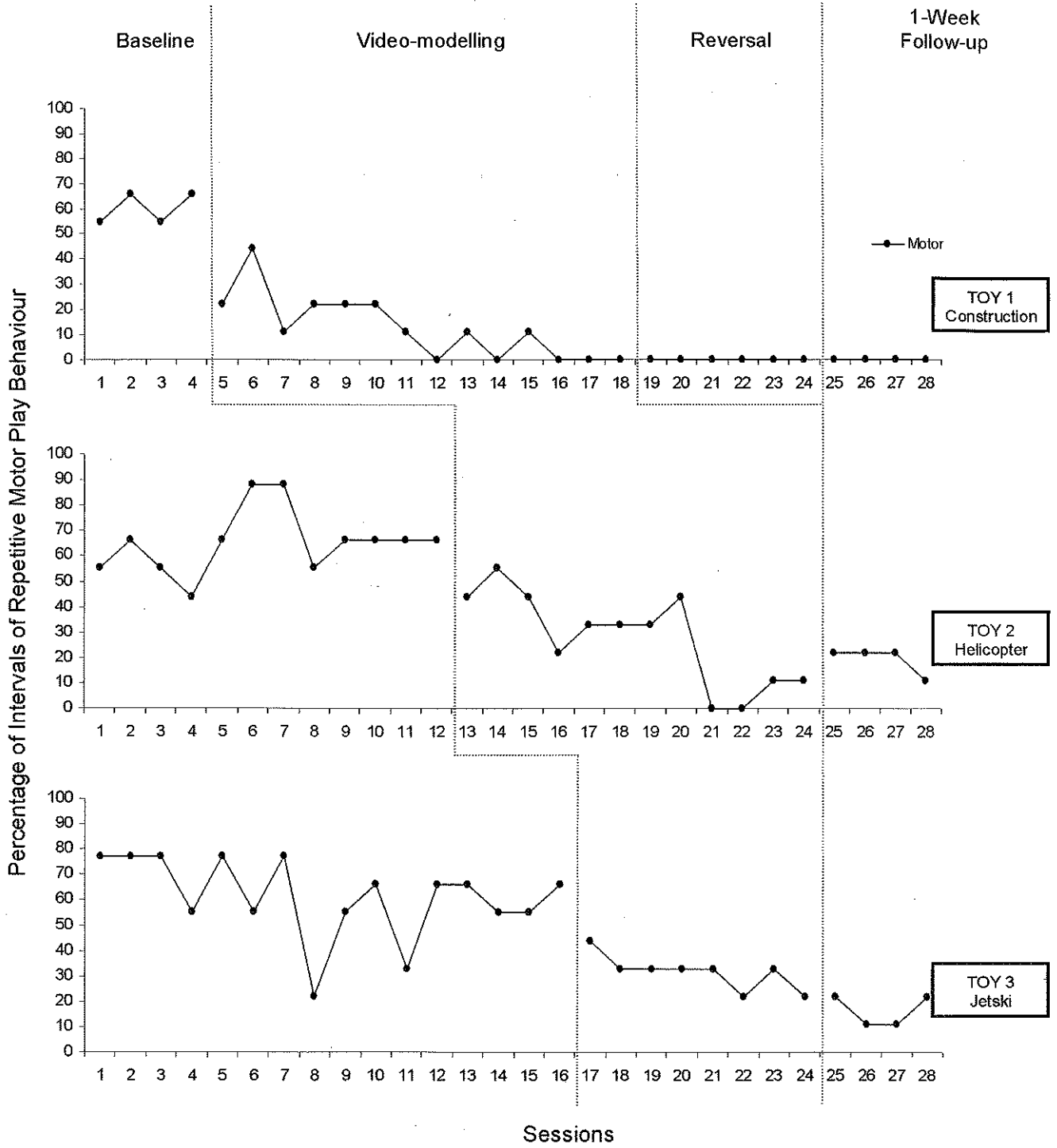


Figure 2.

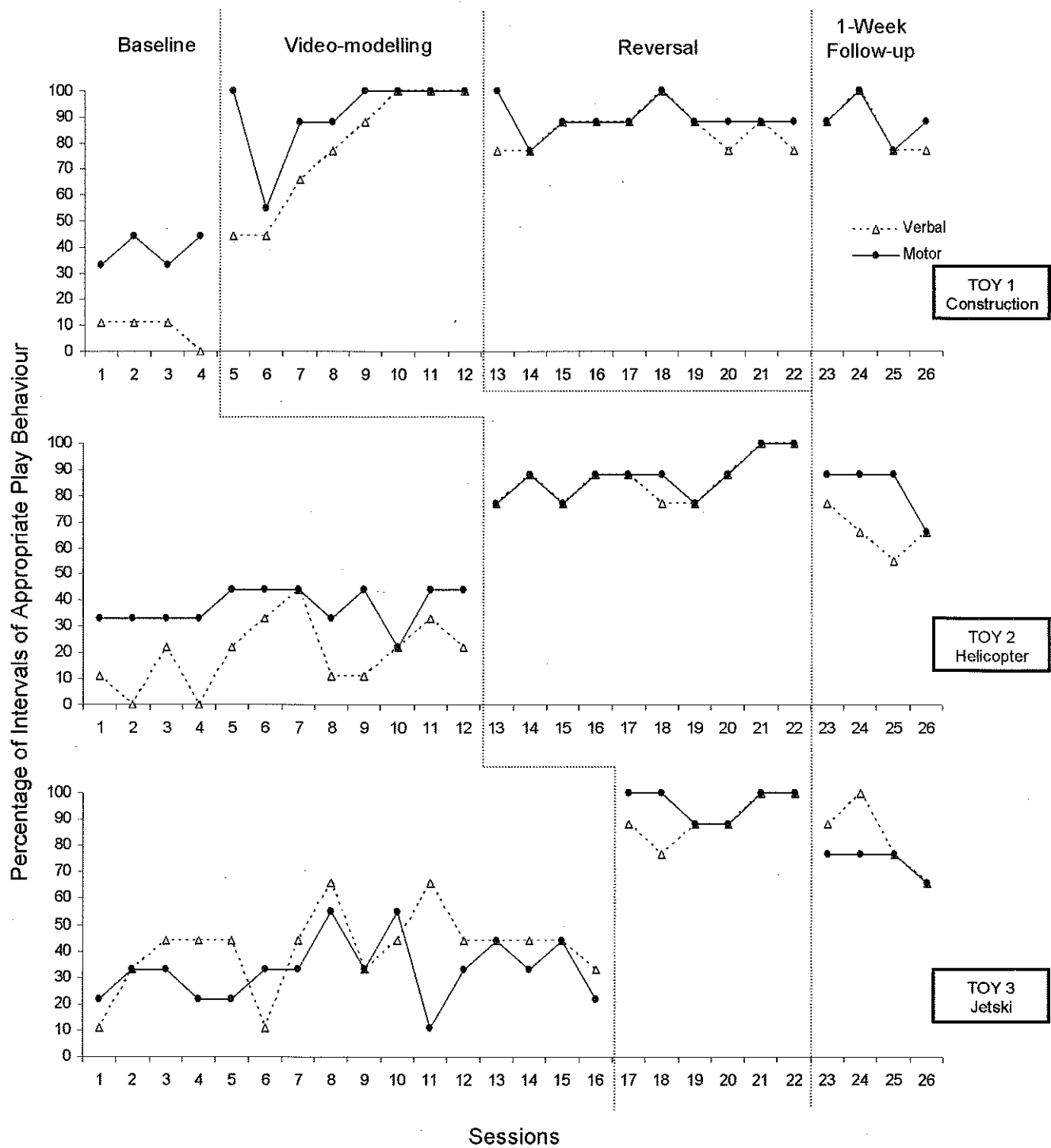


Figure 3.

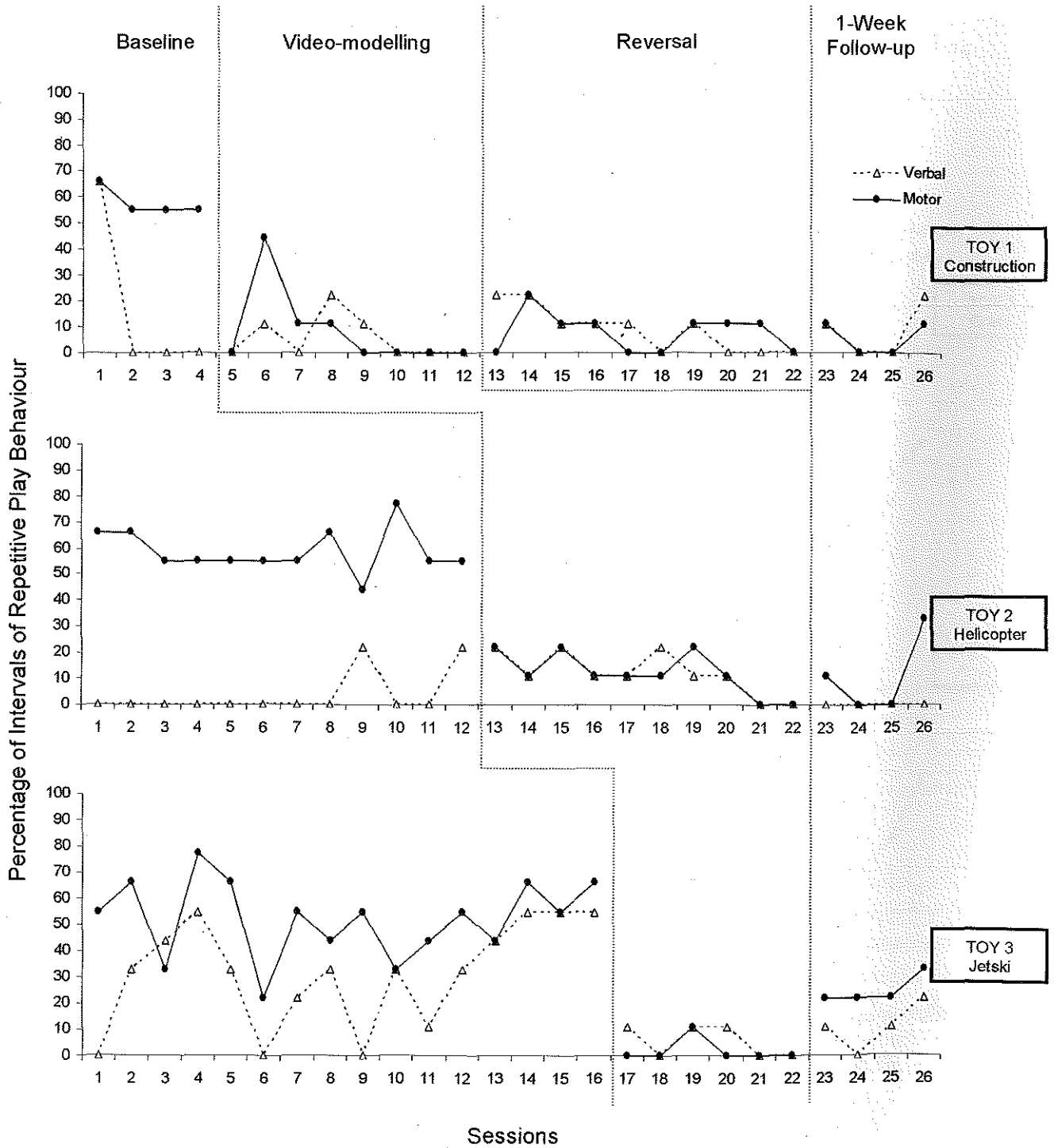


Figure 4.

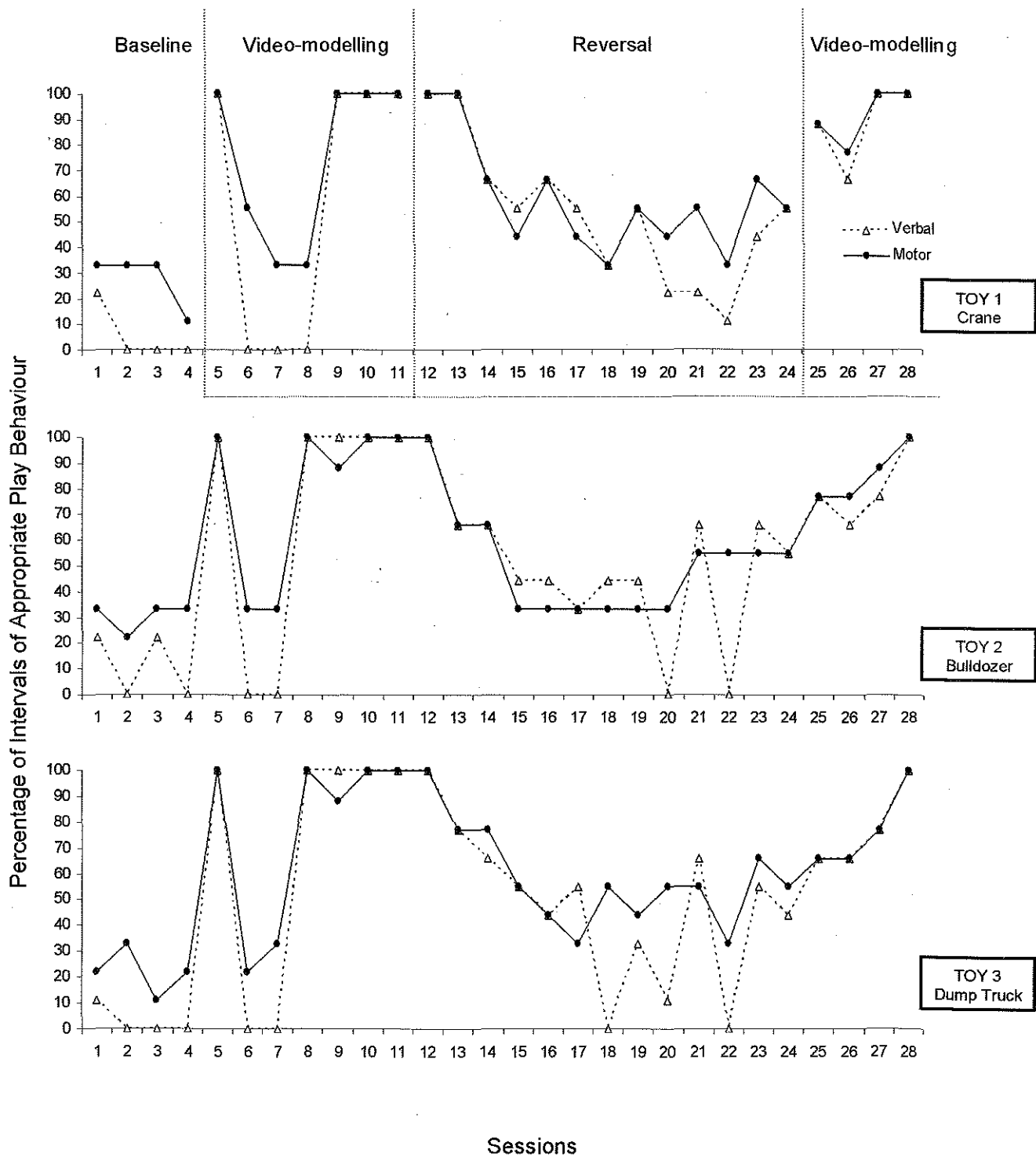


Figure 5.

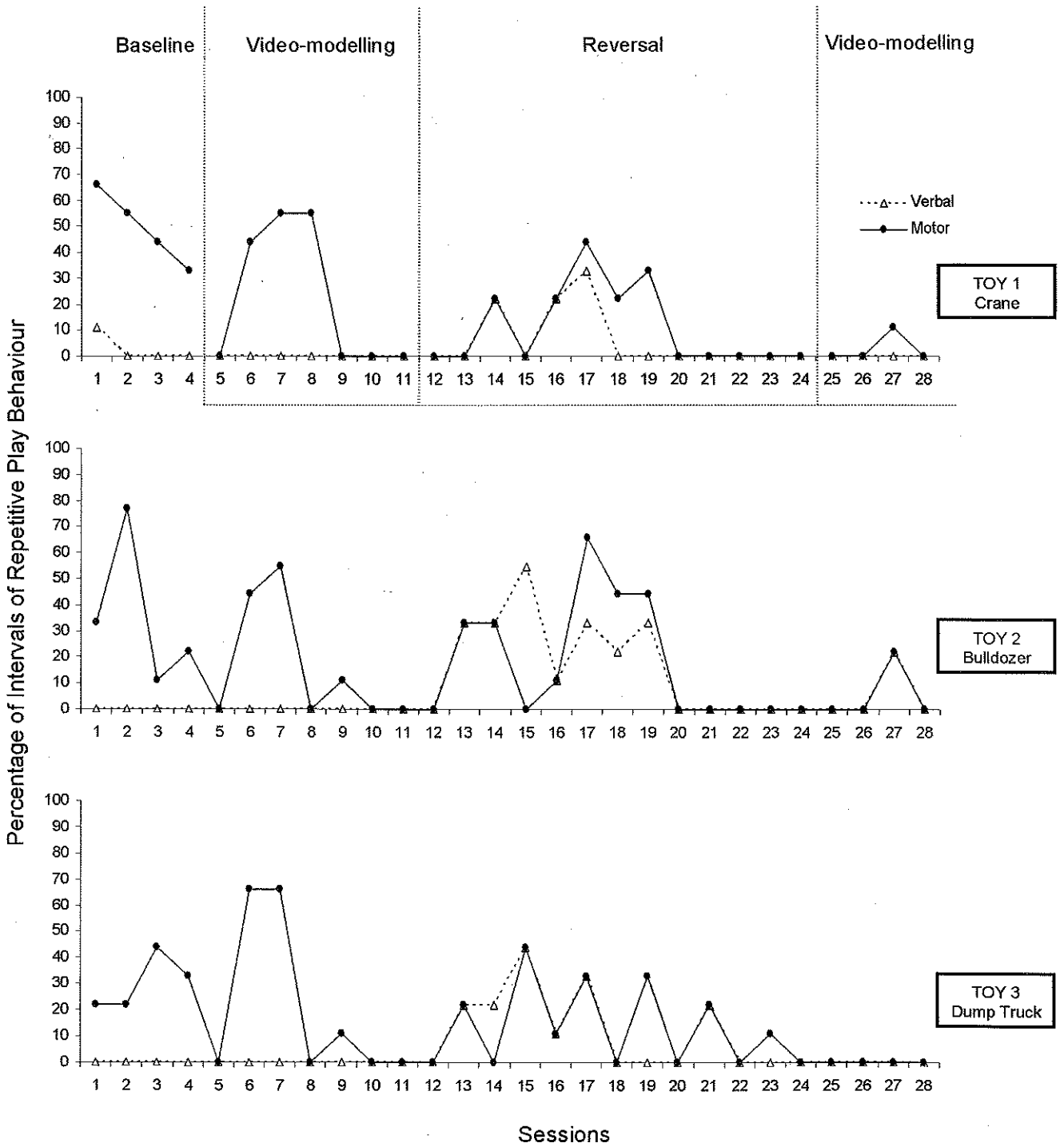


Figure 6.

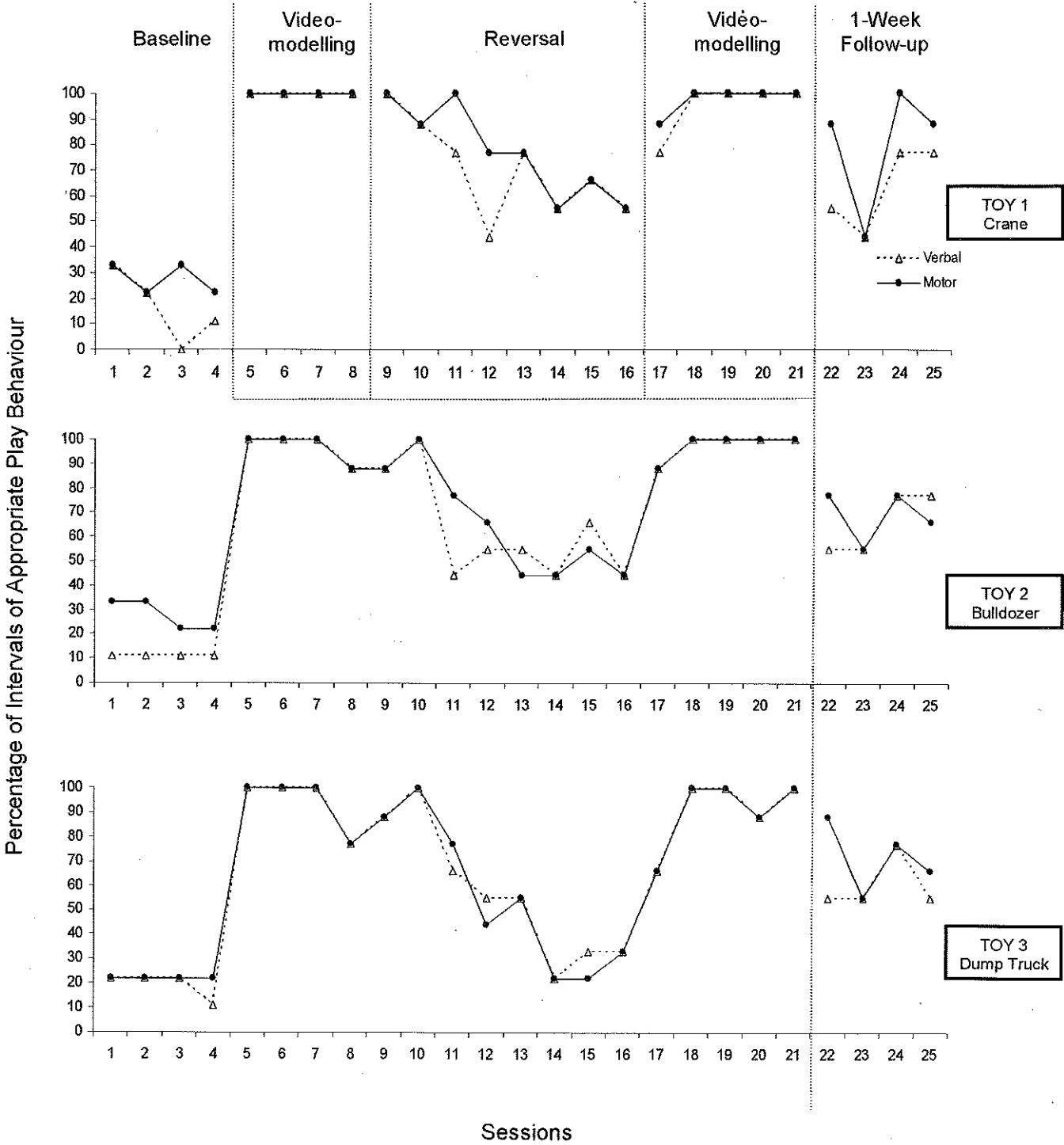


Figure 7.

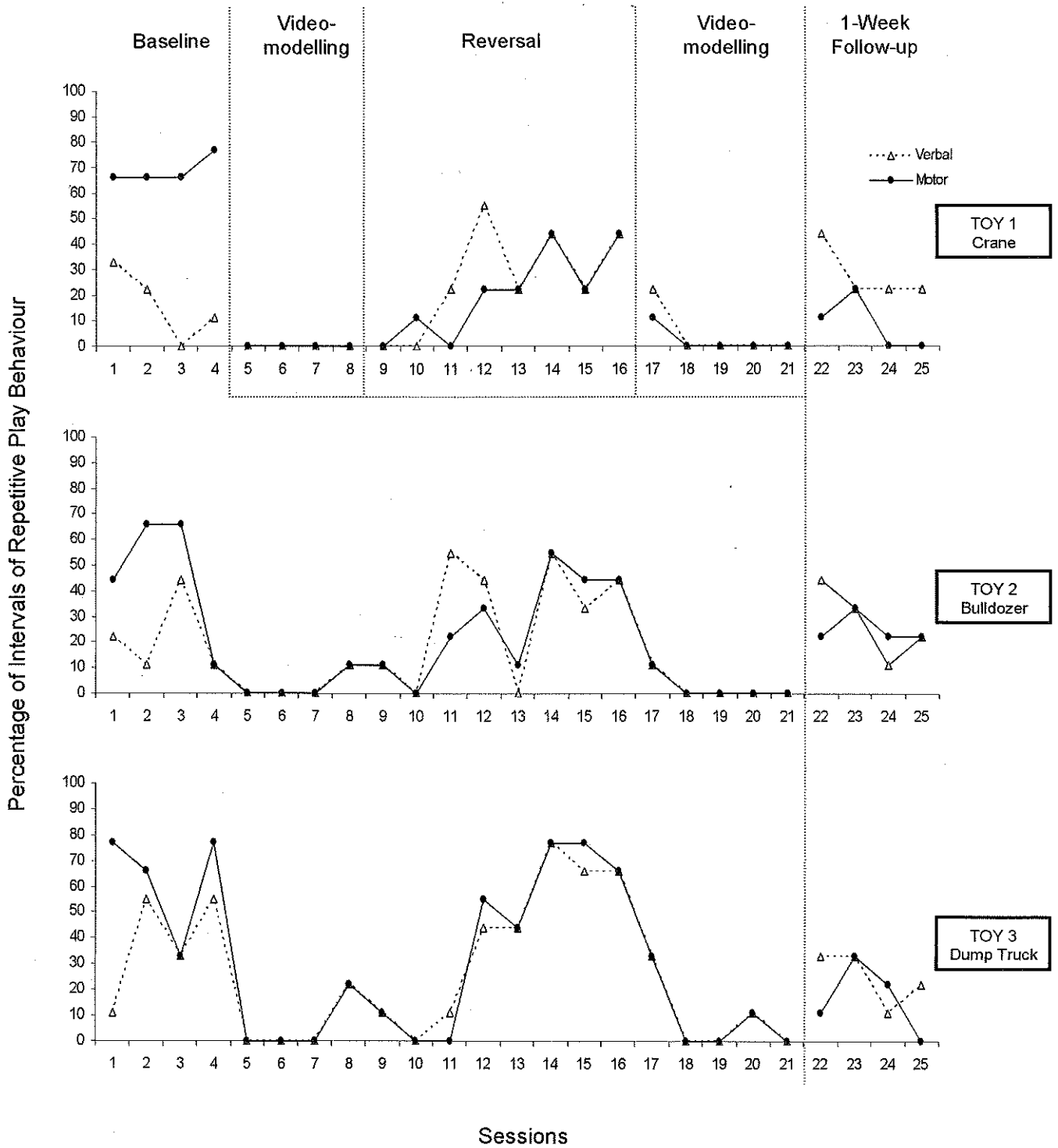


Figure 8.

Appendix A

LEARNING TO PLAY BY WATCHING VIDEOTAPES

Information sheet for guardians of child participants

Thank-you for considering your child's participation in my research project. My name is Claire Paterson and I am a fourth year Psychology student at Edith Cowan University. I am conducting a research project as part of my Honours program. This study has been approved by the Ethics Committee of the School of Community Services, Education, and Social Sciences at Edith Cowan University.

Modelling occurs when one person observes the behaviour of another and then attempts to imitate that behaviour. It has been shown to be an effective way of teaching children with autism and has been used as a teaching tool for a number of years. Recent research has demonstrated that filming models performing behaviour such as playing with a toy, and presenting the video of the model to children with autism can also be an effective way of teaching these children.

My research project focuses on video-modelling and play skills. The research will take place at the primary school in an allocated room during school hours and will involve 3 to 5 sessions per week and 16 sessions overall. The sessions will last approximately 20 minutes and are conducted individually. The children will be treated on an individual basis and consultation on play preferences will be made with their teachers. Names of participating children will be changed in the research to maintain confidentiality.

As the study requires the children to attend to a short video, a pre-existing ability to watch television for a minimum of 60 seconds is needed. Participating children also need to possess basic imitation skills (ability to copy the behaviour of another person). Feedback on your child's performance will be available upon request after completion of the study.

If you have any questions or would like to discuss any concerns about the study, please contact me on (08) [REDACTED] or [REDACTED]. If you would like to speak to my academic supervisor you can contact Dr Lu Arco on (08) 6304 5192. If you would like to discuss this study with an independent person please contact Julie Ann Pooley on (08) 6304 5591 at the School of Psychology at Edith Cowan University.

If you would like your child to participate please complete the informed consent form and return it to your child's teacher.

Thank-you for your interest

Claire Paterson

Appendix B

Consent Form

I _____ (the parent/guardian of the participant) have read the information sheet provided with this consent form and any questions I have asked have been answered to my satisfaction.

I agree to allow my child _____ (name) to participate in the activities associated with this research and understand that I can withdraw consent and from the study at any time.

I understand that information on my child's diagnosis, level of functioning, and academic standing will be included in this research.

I do / do not (please circle) agree for the research to contact me by telephone to discuss the research project.

I agree that the findings from this study may be published, provided my child is not identifiable.

Signed:

(Parent/Guardian of the participant)

Date

(Researcher)

Date

Appendix C

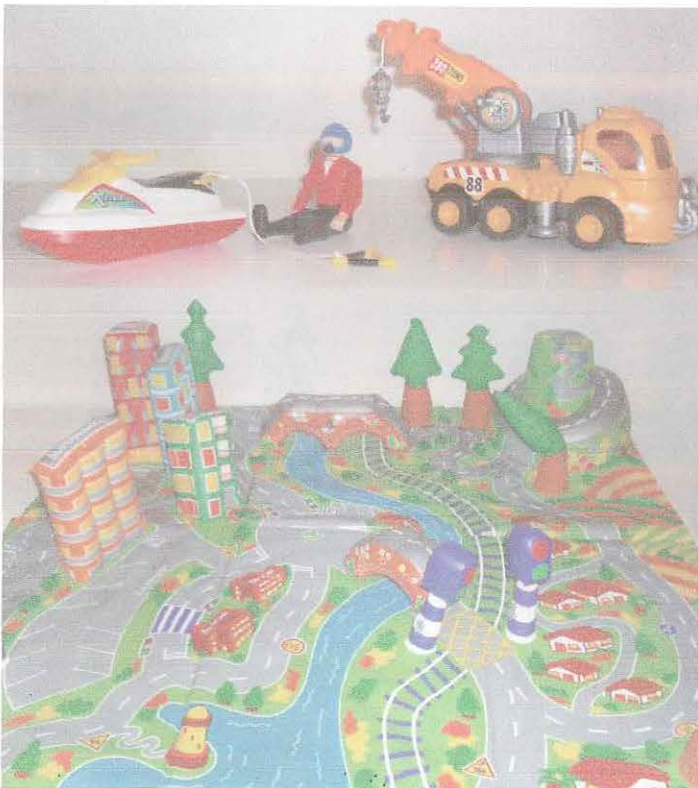
Unrelated Toys



Toy 1
2 x men figurines
Site tower / gate
Bulldozer
Dump truck
Wheelbarrow
Rocks



Toy 2
Helicopter
Man figurine
Elephant
Net



Toy 3
Man figurine
Jetski
Crane
Play mat

Appendix D

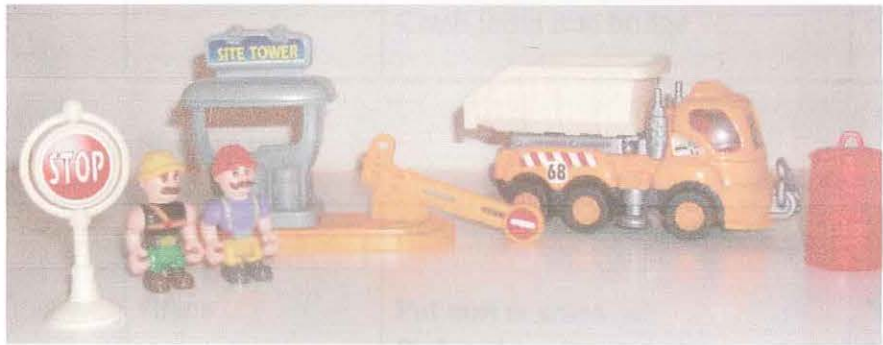
Related Toys



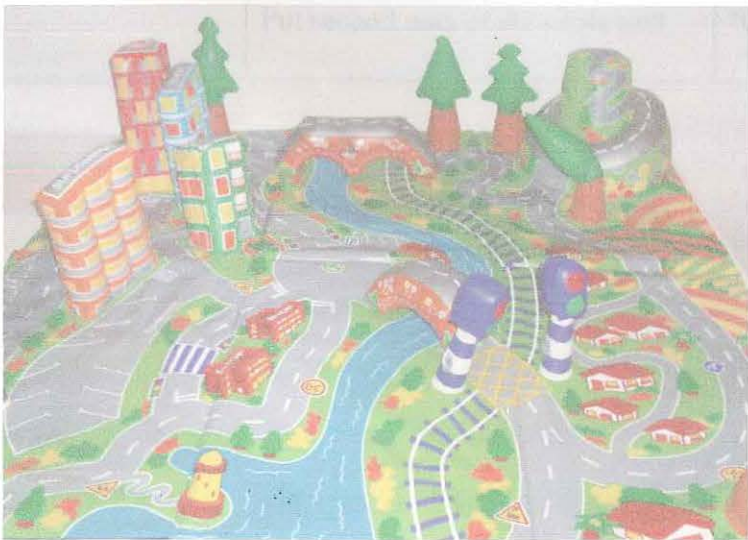
Toy 1
Crane
2 x Men
figurines
Stop sign
Barrel
Site tower / gate



Toy 2
Bulldozer
2 x Men
figurines
Stop sign
Barrel
Site tower / gate



Toy 3
Dump truck
2 x Men
figurines
Stop sign
Barrel
Site tower / gate



Play mat
Toys 1, 2 & 3
Were present
with the play mat

Appendix E

Examples of Video Footage Content

Unrelated Toys

	Modelled Motor Behaviour	Modelled Verbal Behaviour
Toy 1 Construction toys	Put men in truck cab Open gate and drive truck through Push wheelbarrow and tip rocks in bulldozer	"Get in" / "in the truck" "Open gate" / "Brmm" "Get the rocks" / "tip!"
Toy 2 Helicopter toys	Spin helicopter blades Put man in cockpit Put elephant in the net	Flying sounds / "fly fly" "In you go" / "lets fly" "Get the elephant" / "put him in"
Toy 3 Jetski toys	Put man on jetski Push jetski along river Crash jetski into bridge	"Get on" / "on the jetski" "push jetski" / "down the river" crash sounds / "oh no, crashed"

Similar toys

	Modelled Motor Behaviour	Modelled Verbal Behaviour
Toy 1 Crane	Put man in crane cab Pick up barrel with crane Put second man in the crane seat	"Get in" / "off to work" "get the barrel" / "Lift it up" "Get my friend" / "lets go"

Appendix F

Tally-sheet

VIDEO INTERVENTION

Name:

Session

Appropriate Verbal & Appropriate Motor Play

TOY 1

	Verbal	Motor	Comment
1	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
2	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
3	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
4	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
5	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
6	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
7	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
8	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
9	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	

TOY 2

	Verbal	Motor	Comment
1	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
2	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
3	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
4	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
5	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
6	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
7	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
8	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
9	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	

TOY 3

	Verbal	Motor	Comment
1	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
2	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
3	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
4	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
5	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
6	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
7	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
8	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	
9	Rep <input type="checkbox"/>	Rep <input type="checkbox"/>	