

**Use of Video Modeling in combination with Prompting and Reinforcement for  
Teaching Functional Play to Children with Autism**

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**ABSTRACT**

**Objective:** Children with autism spectrum disorder (ASD) of severe level frequently display immature, stereotypical, and repetitive play behaviours. Appropriate play skills increase their chances to mix up with other children, which in turn may help them to improve their socio-communication skills. Video modeling has been proved to be an effective intervention for children with ASD. In case of severe autism, video modeling as the only intervention may not be effective because these children have many other challenging behaviors.

**Method:** The present study compared two interventions, one was video modeling (VM) and other was combination of video modeling, prompting, and reinforcement (ComVM) to develop functional play skills in children with severe autism. Multiple baseline design was applied. Six children diagnosed with ASD between age group 6 to 8 years were assessed on Indian Scale for Assessment of Autism (ISAA) and were randomly placed in two intervention conditions.

**Results:** All the participants learnt functional play skills to varying degrees in both the conditions. Maintenance of the skills at one-month follow-up was also observed.

**Conclusion:** Video modeling was observed to be effective technique when combined with prompting and reinforcement in imparting play skills to children with severe autism.

**Key Words:** Video modeling, Autism, functional play, Reinforcement, prompting

### **Introduction**

Rise in prevalence of Autism Spectrum Disorder (ASD) has created significant concern worldwide. In India, a recent review has reported a pooled percentage prevalence of 0.09-0.11 among children with ASD of the age group 0-18 years (Chauhan et al., 2019). These estimates are quite lower in comparison to prevalence rate reported in United States, which was 14.6 per 1000 (Elsabbagh et al., 2012). More recently, Mahapatra et al. (2019) has estimated approximately 17–20 lakhs children with ASD in India. According to Diagnostic and Statistical Manual of Mental Disorder- Fifth edition (DSM-5), Autism is a life-long neurodevelopmental disorder with three essential features which are pervasive and persistent impairment in reciprocal social communication and social interaction, and presence of restricted, repetitive patterns of behavior, interests, or activities that are usually present from early childhood. These children with ASD face difficulty in interacting with others, which restricts their everyday functioning.

Children with ASD of moderate to severe level often have delayed speech and language, with many of them have little to no speech at all (De Weerd, 2013). Along with severe deficits in social communication, they also exhibit severe maladaptive behaviours like aggression, tantrums, and self-injurious behavior. Children with ASD frequently lack in age-appropriate play skills when compared to same-age typically developing children (Kossyvaki & Papoudi,

2016). They tend to have immature play (e.g., putting objects in their mouth), have fixation to a particular part of toys or objects (e.g., playing with wheels of toy cars), and have lack symbolic and pretend play. Play skills have fundamental role in helping children to make sense of their social world. The level of play depends on the severity level of autism. Children with severe autism often lack functional play skills (Honey et al., 2007), which involve playing with a toy in a functional manner (e.g., pretending to eat a toy banana as a real banana). It has been observed that functional play promotes social and cognitive development (Siraj-Blatchford, 2009) and also reduces inappropriate behaviours (Lang et al., 2009). It is very important to find out effective interventions to facilitate development of play skills and also to alleviate problem behaviours in this population.

Play-based interventions on children with ASD have shown improvement in communication skills (Toth et al., 2006), cognition (Singer et al., 2006), and social and emotional interactions (Ashiabi, 2007). Some of these play-based interventions have also reported reduction of inappropriate behaviours (Nikopoulos & Keenan, 2003).

There are several intervention-based studies on functional play skills of preschoolers with severe level of autism (Dykstra et al., 2012). Two studies on children with severe autism in the school-going age (6- 8 years) used TEACH based intervention and prompting, both the studies obtained increase in the functional play (Lang et al., 2009). In the existing literature, Video modeling has been proved to be one of the promising and evidence-based interventions in teaching play behaviours of children with ASD (Boudreau & D'Entremont, 2010; Lang et al., 2009). The children with ASD do not learn appropriate play skills by themselves because of too many distractions present in the natural environment. According to MacDonald (2009),

videos help these children to observe play without much distractions and also act as prompts that promotes imitation of modeled behaviours. Video modeling is a time and cost effective intervention because videos can be used on multiple individuals and also reduces the amount of interpersonal interaction required for learning. (Charlop-Christy et al., 2000; MacDonald, 2009). It also lessens attention and language demands required in real-life interaction.

Some of the previous studies used video modeling alone and reported substantial improvement in social behaviors (Charlop-Christy et al., 2000; Nikopoulos & Keenan, 2003). In a study (Boudreau & D'Entremont, 2010), video modeling phase demonstrated marked increase in modeled and unmodeled actions and scripted verbalizations. Video modeling when combined with reinforcement showed more improvement in modeled actions and scripted verbalizations. Some of the studies have used video modeling along with other techniques such as corrective feedback, prompts and reinforcement (Bagaiolo et al., 2017; Boudreau & D'Entremont, 2010; Maione & Mirenda, 2006).

The present study was conducted in the National Capital Territory of India. In India, there is more focus on academics than the play skills of children with ASD. The present study attempted to develop play skills in children diagnosed with ASD because play skills may support them in interacting with their peers.

The present study used video modeling, prompting and reinforcement to develop functional play skills in children of age group 6-8 years diagnosed with moderate to severe autism. The children were divided into two groups, video modeling (VM) and video modeling combined with prompting and reinforcement (ComVM) to observe the importance of other intervention modalities along with video modeling.

## Method

The present research study is a part of Doctorate of Philosophy programme and was approved by the Board of Research Studies at University of Delhi. The study followed ethical considerations and informed consent of parents was obtained.

Pseudonyms were given to the children in the research article to maintain the confidentiality of the participants.

## Participants

### *Eligibility*

Children between age group 6 to 8 years with moderate to severe autism studying in a private inclusive school setting, were screened for the present study. The children who had no to little functional play skills were included. The children who could not attend the videos for more than 30 seconds were excluded from the study.

## Video Modeling

Video Modeling included two boys and one girl. Sachin was a six-year old boy, had been diagnosed with ASD in a private hospital. He was very talkative and also had echolalia. On Indian Scale for Assessment of Autism (ISAA; Ministry of Social Justice and Empowerment, 2009), his total autism score was 107, suggestive of moderate autism. On Developmental Screening tool (DST; Bharath Raj, 1977; 1983), his developmental functioning was moderately delayed. According to his teacher, he also had inattention issues along with hyperactivity. He was destructive in nature and used to break all the toys provided to him. Sunil was an eight-year old boy, had been diagnosed with Autism by a public hospital. His total autism score was 119 on ISAA, suggesting moderate autism and moderately developmental functioning on DST. He had expressive speech of two words, “*mummy*” and “*de do (give)*”. He had several repetitive and stereotypical behaviours, like revolving around pillars, writing spellings

of movies in a particular sequence, etc. He used to get aggressive if he was stopped from engaging in his stereotypical behaviours. Tanu was a seven-year old girl, with no speech at all. She used to write whatever she had seen before in the written form, but she needed a sort of little touch of familiar others on her hands or shoulders to write. Her score on ISAA was 118, suggesting moderate autism and on DST, she had moderate delay of developmental functioning. Her non-verbal communication was very limited; she used to respond to “Hello” by shaking hands and by pointing at few objects of her need. She had no interest in playing with objects.

### **Video Modeling + Prompting + Reinforcement**

Joy was a six-year old boy. He had been diagnosed with childhood autism in a public hospital. His ISAA score was 108, suggesting moderate autism. On DST, he had moderated delay in developmental functioning. He was attending an inclusive school. He had hyperactivity and used to touch everything around him. He had severe echolalia and his speech was incomprehensible. He could write and read familiar words easily. Rati was an eight-year old girl, was diagnosed with ASD in a public hospital. ISAA score was 109, suggesting moderate autism. She had moderate delay on DST. She had no speech at all. She had aggressive behavior, like biting and scratching others without much provocation. She used to throw all things around her. She would carry a box with her all the time. Vivaan was a seven-year old boy, diagnosed with autism at the age of 5 years by a private pediatrician. His ISAA score was 118, suggesting moderate autism. He had moderate impairment in developmental functioning. He had no speech at all. He would hold hands of his mother to tell his needs. He had stereotypical behavior of spinning, playing with his fingers, pushing his neck forward and backward, and looking at things with an angle.

### **Experimenter and Interventionists**

Main researcher and four psychology postgraduate volunteers participated in the present study. Each intervention group had two volunteers for implementation of intervention and data collection.

### **Settings**

Sessions were held in a school setting after the school. There were two rooms for two different interventions. Toys were placed in a locked cupboard and were taken out according to the session plans.

### **Design and Analysis**

Single case, multiple baseline design was used. Six children were randomly and equally divided into two intervention groups, i.e., video modeling and Combined video modeling. There were three phases of the study, i.e., baseline, intervention, and maintenance phases. The analysis of data was done with the help of two indices of effect sizes - Nonoverlap index (NAP; Parker & Vannest, 2009) is percentage of all pairwise comparisons, which show improvement across phases. Tau-U (Parker & Vannest, 2011) was also used to assess non-overlaps across phases after controlling for baseline trend.

### **Procedure**

Five video clips of typically developing children playing with toys were recorded. Each video clip was of 20-30 seconds. Five toys - electric spin and magnetic fishing toy, nesting cups, racing track with cars, clay and moulds, and xylophone with piano were selected. Each video displayed a child playing with any one toy. The video starts with the instruction, "Lets play" from examiner. Then, the child selects one toy out of three toys, pick and place the toy on the table. The child

was shown playing with the toy at a normal pace. There were in between verbal praises when the child shows appropriate play.

### **Dependent measure**

The dependent measure was duration of appropriate play. An appropriate play without any prompts and reinforcement of 2 minutes was scored as 1 for both the intervention groups.

### **Study Phases**

#### ***Baseline phase***

Each child was sent to the intervention room along with two teachers for 30 minutes. Three toys were placed on the table and child was given the instruction, “Lets play”. The child was not given any type of intervention during the baseline. Only physical assistance was provided to the children in holding of the toys or placing the toys back at their respective places. No feedback was provided for correct or incorrect responses.

#### ***Intervention Phase***

##### ***VM***

Two- three video clips were shown in every intervention session. Each video was demonstrated three times. With each demonstration, the child was taken to the table where the demonstrated toy was kept. The child was given the instruction to play. No other prompt or reinforcement was given, only physical assistance was provided during the rehearsal. After demonstration of the videos and rehearsal, the child was sent to the playroom. The child was again instructed to play. Each play session was of 30 minutes. The duration of appropriate play was recorded in each session. No videos were shown during the play session.

### *ComVM*

With each video demonstration, the child was taken to the table where the demonstrated toy was kept. The child was instructed to play. During the rehearsal, both physical and verbal prompts were given to the child for appropriate play. Reinforcement (Edibles) was also given after display of appropriate play. After watching of videos and rehearsal, the children were sent to playroom where no other intervention was given except the instruction to play. The play session was of 30 minutes. The duration of appropriate play was noted for each child.

Inter-observer agreement for accurate data collection of appropriate play for fifty percent of the sessions was also calculated. The agreement was done during all the three phases. Two graduate-psychology volunteers collected data for each intervention. And average of their data was calculated as a final score for appropriate play. Procedural fidelity was checked by another set of two post-graduate volunteers (who were blind to the study objectives), they were given a form consisting of seven questions about procedure of intervention. They had to mark whether the step was followed in 'yes' or 'no'.

### **Results**

Functional play data was displayed in the time series graphs for each participant (Figure. 1 & 2), with x-axis representing number of sessions across baseline, intervention, and maintenance phases and y-axis represent duration of play. Two minutes of appropriate demonstration of functional play was scored as 1 point, which means 10 minutes of appropriate play means 5 points.

The visual analysis of graphs provided evidences of causal relation between the intervention and dependent variable. Non-overlap of all pairs (NAP; Parker and Vannest, 2009) was calculated for each participant to compare between baseline and

treatment data of the interventions (Table.1). Interpretation of NAP given by Parker and Vannest suggests 0-65 % of non-overlap means weak effects, 66-92% reflect medium effects, and 93-100% strong effects. Tau-U was also calculated to find out the effect sizes after a baseline trend correction (Table 1).

Overlap analysis were obtained using NAP for both the interventions. In VM, one child (Sachin) demonstrated strong effect with 100% non-overlap. The remaining two children (Sunil and Tanu) obtained 88% and 68% of non-overlap, respectively indicating medium effect. Medium effect means the changes in the functional play of children after the intervention were visible to the naked eyes. When compared to the baseline data, the ComVM showed low percentages of overlap with the baseline data points. Joy and Rati demonstrated NAP of 100% and 97 % NAP by Vivaan. These NAP values indicated strong effect range, which implies changes were grossly perceptible after the intervention. According to Tau-U index, both interventions had significant effects on appropriate play of children with severe autism. In ComVM, intervention phase contrasted with baseline phase showed overall 83% improvement, significant at  $p = .0002$ . Whereas, VM group showed 65% ( $p = .001$ ) improvement when intervention phase was contrasted with baseline phase.

Follow-up data following after one month of treatment phase showed maintenance of functional play skills, with one or two data points below the treatment phase. However, the maintenance phase had increased duration of functional play skills in comparison to the baseline level. Inter-observer agreement was 90-95 % for each child. Procedural fidelity for twenty percent of the sessions was evaluated. It was found that 5-7 steps were implemented accurately as per the intervention protocol by the interventionists.

## DISCUSSION

Play skills generally develops at the first year of life in children (Benson & Haith, 2009). Play provides a setting where social interaction can take place among children, further leading to development of pre-academic, communication, and social skills. Play repertoire of children with ASD is very narrow and stereotypical in nature. The present study used a single case multiple baseline design to develop functional play skills with the use of video modeling intervention. Additionally, the study compared video modeling as a single intervention modality with video modeling combined with prompting and reinforcement. Both interventions reported improvement in functional play skills of children having moderate to severe autism. In VM, child (Sachin) who could improve the most was towards the lower side of moderate autism and had expressive language. The other two children (Sunil and Tanu) were towards the high side of moderate autism and had no to little speech. Both the children were lacking in social initiation and had stereotypical behaviours. VM alone could not obtain improvement in these two children, possibly due to the presence of repetitive and stereotypical behaviours. Prompting to stop stereotypical behaviours could not be provided as the group was only given video modeling.

Contrasting results were observed in video modeling + Prompting + Reinforcement group. All the three children displayed increased functional play skills, irrespective of the presence of their maladaptive behaviours. The children were prompted when they engaged in stereotypical or aggressive behaviours and cued them to continue with play behavior. Additionally, physical assistance was also provided when they threw toys on the floor or put the toys in the mouth. Previous studies have also highlighted the importance of decreasing stereotypical manipulation of objects along with increasing functional play skills (Warreyn et al., 2014).

Several previous research studies suggested determination of effectiveness of video modeling without using other intervention modalities. (Kouo, 2018; Maione & Miranda, 2006). Hine and Wolery (2006) used only videos to develop play skills in a 3-year old girl. The study reported MPND of 18% - 94% increase in modeled play behavior and MPND of 18% in novel play behaviours with other toys.

Another study (Nuzzolo- Gomez et al., 2002) paired toy play with reinforcement and obtained increase in functional play (MPND of 55%) and decrease in stereotypical play (MPND = 33%).

The other research studies could observe improvement in play skills with the help of video modeling alone as they believed play itself act as a natural reinforcer (Nikopolous, 2003). However, a previous study by Nikopolous (2003) could not obtain maintenance of behavior in three out of seven children because of the presence of challenging behaviours. Maione and Miranda (2006) had to include prompting, reinforcement, and feedback as video modeling alone could not generalize the play skills.

The current findings suggested that the modeling was only required for the development of functional play during the intervention phase. The play skills were maintained for one month after the intervention, possibly play might have become intrinsically motivating for the children. Other studies suggested that contingency (of edibles) with play might have resulted in the maintenance of play behavior even after the withdrawal of reinforcement (Machalicek et al., 2009).

In the present study, duration of appropriate play reduced in the maintenance phase but remained higher than the baseline, this finding was found to be consistent with previous studies (Boudreau & D'Entremont, 2010; Hine & Wolery, 2006). The procedural fidelity and inter-observer agreement were also evaluated to maintain the

internal validity of the study.

### **Limitations**

The present study did not study stereotypical behavior before and after the intervention. However, it was suggested in previous studies that challenging behaviours reduce with increase in play behavior (Machalicek et al., 2009; Warreyn et al., 2014). Generalization of the skills was also not assessed. It would have been interesting to find out how these children used their new set of skills in their respective environments. The interventions were conducted in two different groups of children to avoid carry-over effect of one intervention to another intervention.

### **Conclusion**

The present study in concordance, with other previous studies reiterate that the children with ASD can be guided and supported for play activities. Engagement in functional toy play may provide children with ASD opportunities to mix up with typical developing children and learn more interactive social play. Further, the study recommends for randomized control trials of video modeling with larger sample size.

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### **References**

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Association.
- Ashiabi, G. S. (2007). Play in the preschool classroom: Its socioemotional significance and the teacher's role in play. *Early Childhood Education Journal*, 35(2), 199- 207.
- Bagaiolo, L. F., Mari, J. D. J., Bordini, D., Ribeiro, T. C., Martone, M. C. C., Caetano, S. C., Brunoni, D., Brentani, H., & Paula, C. S. (2017). Procedures and

- compliance of a video modeling applied behavior analysis intervention for Brazilian parents of children with autism spectrum disorder. *Autism*, 21(5), 603-610.
- Benson, J. B., & Haith, M. M. (Eds.). (2009). *Diseases and Disorders in infancy and Early Childhood*. Academic Press.
- Boudreau, E., & D'Entremont, B. (2010). Improving the pretend play skills of preschoolers with autism spectrum disorders: The effects of video modeling. *Journal of Developmental and Physical Disabilities*, 22, 415–431.
- Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders*, 30(6), 537–552.
- Chauhan, A., Sahu, J. K., Jaiswal, N., Kumar, K., Agarwal, A., Kaur, J., Singh, S., & Singh, M. (2019). Prevalence of autism spectrum disorder in Indian children: a systematic review and meta-analysis. *Neurology India*, 67(1): 100-4.
- DeWeerd, S. (2013). Study of nonverbal autism must go beyond words, experts say. *Spectrum*, 2.
- Dykstra, J. R., Boyd, B. A., Watson, L. R., Crais, E. R., & Baranek, G. T. (2012). The impact of advancing social-communication and play (ASAP) intervention on preschoolers with autism spectrum disorder. *Autism*, 16(1), 27–44.
- Elsabbagh, M., Divan, G., Koh, Y. J., Kim, Y. S., Kauchali, S., Marcín, C., Montiel-Nava, C., Patel, V., Paula, C.S., Wang, C., & Yasamy, M. T. (2012). Global prevalence of autism and other pervasive developmental disorders. *Autism research*, 5(3), 160-179.
- Hine, J.F., & Wolery, M. (2006). Using point-of-view video modeling to teach play to preschoolers with autism. *Topics in Early Childhood Special Education*, 26, 83–93.

- Honey, E., Leekam, S., Turner, M., & McConachie, H. (2007). Repetitive behaviour and play in typically developing children and children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 37(6), 1107-1115.
- Kossyvaki, L., & Papoudi, D. (2016). A review of play interventions for children with autism at school. *International Journal of Disability, Development and Education*, 63(1), 45-63.
- Kouo, J. L. (2018). The Effectiveness of a Packaged Intervention Including Point-of-View Video Modeling in Teaching Social Initiation Skills to Children With Autism Spectrum Disorders. *Focus on Autism and Other Developmental Disabilities*, 1-12.
- Lang, R., Machalicek, W., O'Reilly, M.F., Sigafos, J., Rispoli, M.J., Shogren, K., & Regehr, A. (2009). Review of interventions to increase functional and symbolic play in children with autism. *Education and Training in Developmental Disabilities*, 44, 481–492.
- Lee, S. Y., Lo, Y. Y., & Lo, Y. (2017). Teaching functional play skills to a young child with autism spectrum disorder through video self-modeling. *Journal of Autism and Developmental Disorders*, 47(8), 2295-2306.
- Luckett, T., Bundy, A., & Roberts, J. (2007). Do behavioural approaches teach children with autism to play or are they pretending? *Autism*, 11(4), 365-388
- Machalicek, W., Shogren, K., Lang, R., Rispoli, M., O'Reilly, M.F., Franco, J.H., & Sigafos, J. (2009). Increasing play and decreasing the challenging behavior of children with autism during recess with activity schedules and task correspondence training. *Research in Autism Spectrum Disorders*, 3, 547–555.
- Maione, L., & Miranda, P. (2006). Effects of video modeling and video feedback on peer-directed social language skills of a child with autism. *Journal of Positive Behavior Interventions*, 8, 106–118.

- MacDonald R, Sacramone S, Mansfield R, et al. (2009) Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis* 42(1): 43–55.
- Mahapatra, P., Pati, S., Sinha, R., Chauhan, A. S., Nanda, R. R., & Nallala, S. (2019). Parental care-seeking pathway and challenges for autistic spectrum disorders children: A mixed method study from Bhubaneswar, Odisha. *Indian journal of psychiatry*, 61(1), 37.
- Ministry of Social Justice and Empowerment (2009). *Scientific Report on Research Project for Development of Indian Scale for Assessment of Autism*. New Delhi: Government of India.
- Nikopoulos, C. K., & Keenan, M. (2003). Promoting social initiation in children with autism using video modeling. *Behavioral Interventions*, 18, 87–108.
- Nuzzolo-Gomez, R., Leonard, M.A., Ortiz, E., Rivera, C.M., & Greer, R.D. (2002). Teaching children with autism to prefer books or toys over stereotypy or passivity. *Journal of Positive Behavior Interventions*, 4, 80–87.
- Parker, R. I., Vannest, K. J., & Davis, J. L. (2011). Effect size in single-case research: A review of nine nonoverlap techniques. *Behavior Modification*, 35(4), 303–332.
- Parker, R. I., Vannest, K. J., Davis, J. L., & Sauber, S. B. (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior Therapy*, 42, 284–299.
- Singer, D. G., Golinkoff, R. M., & Hirsh-Pasek, K. (2006). *Play = learning: How play motivates and enhances children's cognitive and social-emotional growth*. New York, NY: Oxford University Press.

Siraj-Blatchford, I. (2009). Conceptualizing progression in the pedagogy of play and sustained shared thinking in early childhood education: A Vygotskian perspective.

*Educational and Child Psychology*, 26, 77–89.

Toth K, Munson J, Meltzoff AN, Dawson G. (2006). Early predictors of communication development in young children with autism spectrum disorder: joint attention, imitation, and toy play. *Journal of Autism Developmental Disorders*, 36, 993–1005.

Warreyn, P., Van der Paelt, S., & Roeyers, H. (2014). Social-communicative abilities as treatment goals for preschool children with autism spectrum disorder: the importance of imitation, joint attention, and play. *Developmental Medicine & Child Neurology*, 56(8), 712-716.

Table 1 shows Non-Overlap of All Pairs (NAP) and Tau-U indices for Appropriate Play in Children with Severe Autism

	Dependent Measure	
	VM (n=3)	Com VM (n=3)
<b>Range of NAP (n%)</b>	68-100	97-100
Weak Effect (n)	0	0
Medium Effect (n)	2	0
Strong Effect (n)	1	3
<b>Tau-U</b>	0.65***	0.83***

\*\*\*p > .001; VM-Video Modeling; Com VM- Video Modeling + Prompting + Reinforcement

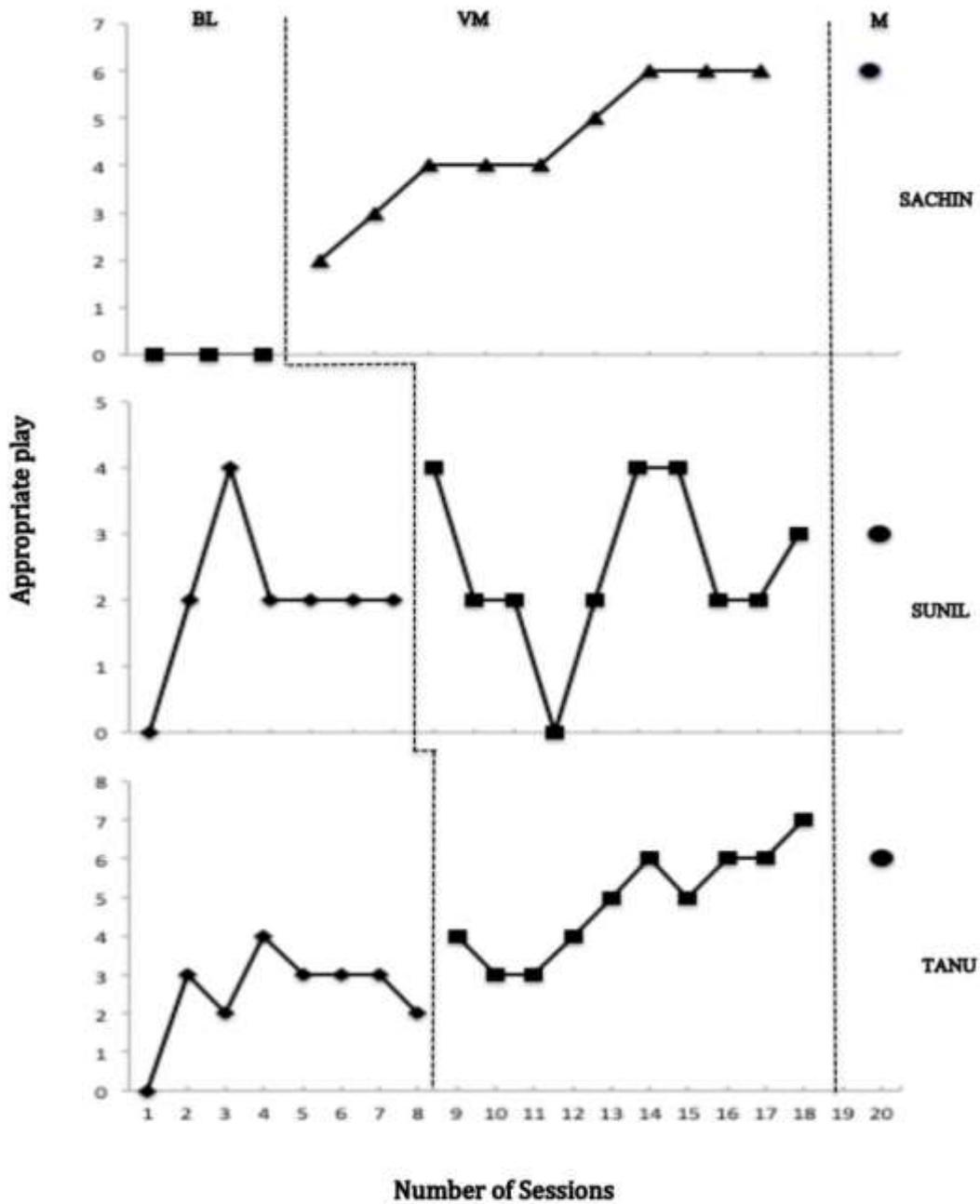


Figure 1. shows appropriate play in VM intervention during baseline, intervention, and maintenance phases

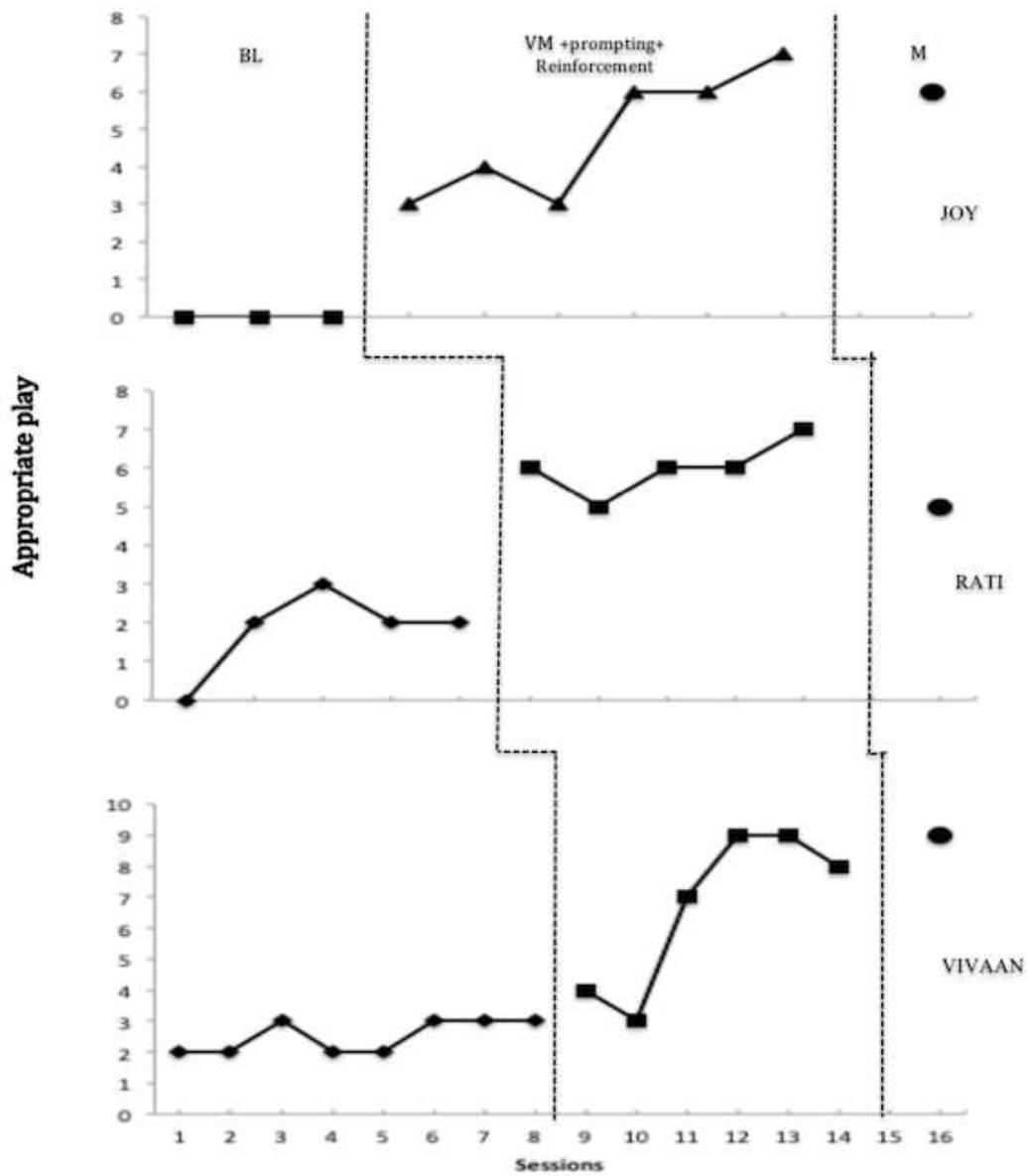


Figure 2. shows appropriate play in ComVM intervention during baseline, intervention, and maintenance phases