

# Teaching Responding to Joint Attention to Children with Autism Spectrum Disorders

Hatice Bilmez<sup>1</sup>, Elif Tekin-Iftar<sup>2\*</sup> and Gonul Kircaali-Iftar<sup>3</sup>

<sup>1</sup>Department of Special Education, European University of Lefke, Cyprus

<sup>2</sup>Department of Research Institute for the Handicapped, Anadolu University, Turkey

<sup>3</sup>Faculty of Education, Maltepe University, Istanbul, Turkey

**\*Corresponding author:** Elif Tekin-Iftar, Department of Research Institute for the Handicapped, Anadolu University, Turkey, Email: eltekin@anadolu.edu.tr

**Published Date:** July 26, 2017

## ABSTRACT

Attention sharing and directing ability regarding interesting events or objects is called as joint attention and accepted to be a precursor for social as well as symbolic communicative development. This ability starts to manifest itself as early as 6 months of age by gaze shift between an event/object and a social partner. Joint attention is substantially delayed or totally absent in individuals with autism spectrum disorder. Therefore, joint attention has to be taught to children with autism spectrum disorder via systematic instruction. A single-subject experimental study was conducted to examine the effectiveness of a least-to-most prompting procedure on acquisition, maintenance, generalization of responding to joint attention to children with autism spectrum disorder. Social validity of a least-to-most prompting procedure in teaching responding to joint attention to children with autism spectrum disorder was also assessed in the study. Three preschool age male children with autism spectrum disorder participated in the study. The data revealed that least-to-most-prompting procedure was effective in acquiring, maintaining, and generalizing the dependent variables consisting of looking at an interesting object/event, and shifting gaze to the adult who initiates joint attention. Subjective evaluation and normative comparison data resulted with positive outcomes. Least-to-most-prompting procedure can be used in schools, home settings, and other community settings by professionals as well as nonprofessionals for teaching joint attention to children with autism spectrum disorder.

**Keywords:** Joint attention; Responding to joint attention; Initiating joint attention; Autism spectrum disorder; Least-to-most prompting

# TEACHING RESPONDING TO JOINT ATTENTION TO CHILDREN WITH AUTISM SPECTRUM DISORDER

Attention sharing and directing ability regarding interesting events or objects is accepted to be a precursor for social as well as symbolic communicative development and starts to manifest itself as early as 6 months of age by gaze shift between an event/object and a social partner. The gaze shift is accompanied by gestures and vocalizations in the initial stages of development and verbalizations later on, all related to that interesting event/object [1-6]. The above mentioned social-communicative ability is called joint attention (**JA**) and mainly involves gaze, pointing gesture, and vocal cues on one hand [7]; and also includes monitoring each other's attention regarding the interesting event or object on the other [3]. Two types of JA are defined in the literature: responding to JA (**RJA**) and initiating JA (**IJA**). RJA involves gaze, head-turn, gestures, and vocalizations/verbalizations in response to a social partner's gaze, head-turn, pointing, and vocal cues directed towards an event or object in the environment. This ability can be observed at about 9 months of age [8]. On the other hand, IJA which emerges slightly later, at about 12 months of age, is said to occur when individual directs attention of one or more social partners towards an event or object by looking at, turning head towards, pointing, and vocally cueing [9].

JA development is substantially delayed or totally absent in children with autism spectrum disorder (**ASD**) and this is considered as a major early sign of ASD [1, 3, 10]. However, individual differences exist among individuals with ASD regarding JA skills and these differences may be explained with variables such as cognitive development level and severity of autistic traits [11].

Significant research efforts are observed for teaching JA skills to individuals with ASD. Behavioral intervention techniques were found to be instrumental for teaching JA skills to children with ASD in a number of single-subject experiments. Whalen and Schreibman [12] taught JA skills to five children with ASD via a combination of pivotal response and discrete trial training. Martins and Harris [13] taught RJA skills to three children with ASD by implementing a time delay procedure with an addition of tangible reinforcers. Taylor and Hoch [14] taught three children with ASD JA skills via least-to-most prompting (**LMP**) and social reinforcement. Isaksen and Holth [15] showed the effects of a sequenced behavioral intervention package for teaching JA skills to four children with ASD. This study had a discrimination training procedure and turn-taking tasks as a context for JA as novel components.

JA skills are assumed to be contributing to cognitive, socio-emotional, and interpersonal interaction of the individual [16]. Therefore, research efforts examining the effectiveness of teaching JA skills to individuals with ASD need to be extended by replicating the previous results, fine tuning the intervention parameters such as presenting and fading prompts, examining the social validity features, as well as strengthening the maintenance and generalization effects [17]. Hence, the present study attempted to address these research needs by aiming to investigate (a) the efficacy of an LMP procedure on acquisition, maintenance, and generalization of RJA

skills by three children with ASD, and (b) the social validity of the intervention and outcomes as investigated by subjective evaluation and normative comparison.

## METHOD

### Participants

Three male children (6 to 7 years old) with ASD, diagnosed by pediatric psychiatrists via DSM-IV-TR criteria [18] participated in this study. They were attending a university special education unit and receiving half-day small-group special education during the course of intervention as well as receiving supportive special education services at a private special education center two-to-three times per week in Eskisehir, Turkey. All of them were performing similar to their peers at fine and gross motor skills, demonstrated appropriate eye contact with others, could respond to their name, attended to an activity for 10 to 15 min, were either non-verbal (Mustafa and Kemal) or had limited communication (Ata). The first author, instructor, assessed the following pre-requisite skills for the children: (a) following simple verbal directions such as “sit down” and “come here”, (b) attending an activity for at least 5 min and (c) establishing eye contact for 5 s.

### Setting, Materials and Research Staff

The instructor conducted all sessions at various locations of the unit. Unusual objects and events in terms of appearance, size, position or location (e.g., a huge stuffed toy placed at the top of the door) were used during the intervention sessions whereas usual objects such as bottles and chairs were used during other sessions.

The instructor was a graduate student in an applied behavior analysis and autism and had prior experience teaching young children with ASD and using the LMP procedure. The reliability data were collected by a graduate student and generalization sessions were carried out by another graduate student of the same program.

### Response Definitions, Data Collection and Behavioral Consequences

There were two dependent variables in the study: (a) looking at the target object/event in response to the instructor’s point, (b) looking back at the instructor after looking at the object/event. The first dependent variable was defined as the participant having his head facing the target stimulus within 3 s after the instructor’s point and the second one was defined as the participant looking back at the instructor within 3 s after looking at the object/event pointed by the instructor.

Five types of possible responses during intervention (i.e., correct response before and after the prompt, incorrect response before and after the prompt and no response) and three possible responses during the rest of the sessions were available. Verbal praise and social reinforcement were delivered to correct responses and incorrect responses and no response were ignored during intervention.

## Independent Variable

The independent variable of the study was, as inspired by Taylor and Hoch [14], an LMP procedure aiming to teach RJA to the participants. RJA consisted of two distinct behaviors: (a) looking at the stimulus to which the instructor points, and (b) looking back at the instructor. The prompt hierarchies were target stimulus, gestural prompt, gestural plus verbal prompt, and physical plus verbal prompt for both behaviors. The duration of the response interval for each prompt level varied between 1 and 3 s.

## Experimental Design

A concurrent multiple probe design across participants with probe trials was used to examine the effectiveness of the LMP procedure in teaching RJA skills to the participants.

## Procedure

A pilot study was conducted prior to intervention with two children who were not the participants of the study. Teaching and testing trials were embedded into daily routines (e.g., going to the restroom prior to snack time). The instructor placed RJA materials at specific locations (e.g., hallways and teachers' room) where the participants could not see prior to the trials.

## Baseline and intermittent probe sessions

Both sessions were conducted with a total of six trials per day. During each trial, the instructor held the child's hand and started to walk with him at the hallway of the unit, while walking together, she pointed at the target stimulus which was a usual object located prior to the session in 1-to-3 steps away from the child with an angle of about 90 degrees. While pointing, the instructor provided task direction (e.g., "Hey, look at that"). Looking towards the target object by turning head in 3 s, and shifting gaze back to the instructor within 3 s was accepted as a correct response. Correct responses resulted in verbal reinforcement and incorrect or no responses resulted in ignoring the behavior during baseline and intermittent probe sessions. Afterwards, the instructor initiated the next probe trial with a different object.

Intermittent probe sessions were planned to test the acquisition of RJA once a week (after completion of the three training sessions). Data collected during these sessions were plotted as intervention data. Correct responses during probe sessions were considered as a criterion for the first phase of the intervention as explained below. When a participant met the criterion (80%), the second phase of the instruction started.

## Intervention sessions

Three intervention sessions, each consisting of six trials, were conducted three days in a week with a total of 18 trials per week. These sessions took place at various locations of the unit where unusual objects or events were previously located at unexpected spots. At the beginning of each intervention trial, the instructor and the participant started to walk hand-in-hand at the hallway

and the instructor immediately provided the JA bid. Prompt hierarchies for teaching first (looking back at the instructor) and second (looking back at the instructor) dependent variables can be seen in Table 1. All of the correct responses during each prompt level were reinforced verbally during teaching both dependent variables.

As soon as the participant looked at the target stimulus, the instructor observed the occurrence of the second dependent variable. There were two phases during intervention. In the first phase, the instructor allowed the participant to interact with the target object/event for up to 2 min. When a participant had 80% correct responding across all dependent variables in the first phase, the second phase of the instruction started. During the second phase, the instructor did not allow the participant to interact with the target object/event.

**Table 1:** Prompt Hierarchy Levels.

Target Behaviors	Prompt Hierarchy Levels			
	First level	Second level	Third level	Fourth level
1. Looking at the target object/event in response to the instructor's point	Verbal direction + pointing	Gestural prompt (e.g., (pointing the target object/event in an exaggerated manner)	Gestural + verbal prompt (e.g., pointing the target object/event in an exaggerated manner and delivering a verbal prompt)	Physical + verbal prompt (e.g., physically guiding the participant's gaze at the object by touching his chin and turning his head towards the stimulus while providing a verbal prompt such as "Look at this")
2. Looking back at the instructor after looking at the object/event	Presence of the instructor	Gestural prompt (e.g., holding an edible in hand, extending the hand towards the stimulus where the participant's gaze was, and shifting the hand towards her eyes by expecting the participant to shift his gaze as well)	Gestural + verbal prompt (saying "Look at me" while shifting the edible from the stimulus to her eyes)	Physical + verbal prompt (physically guiding the participant's gaze towards herself by touching his chin and turning his head towards her face while saying "Look at me")

## Maintenance and generalization sessions

Maintenance data were collected 4 and 6 weeks after intervention sessions. Pre-posttest generalization sessions were arranged prior the first and after the last intervention session to assess whether the. Maintenance and generalization sessions were carried out following the procedures of baseline sessions with an exception of thinning reinforcement to a variable ratio (VR2) schedule.

## Social Validity

Two types of social validity assessments were conducted in the study: subjective evaluation and normative comparison. During subjective evaluation, the instructor carried out semi-structured interviews with the participants' parents to examine the acceptability and importance of teaching RJA to their children with ASD. The subjective evaluation data were analyzed descriptively. For normative comparison purposes [19,20], we compared the RJA performances of the participants with the RJA performances of a reference sample. The reference sample consisted of four typically developing preschool age peers. The instructor carried out a single session consisting of six RJA trials with each peer by following the protocol of baseline and probe conditions.

## Reliability

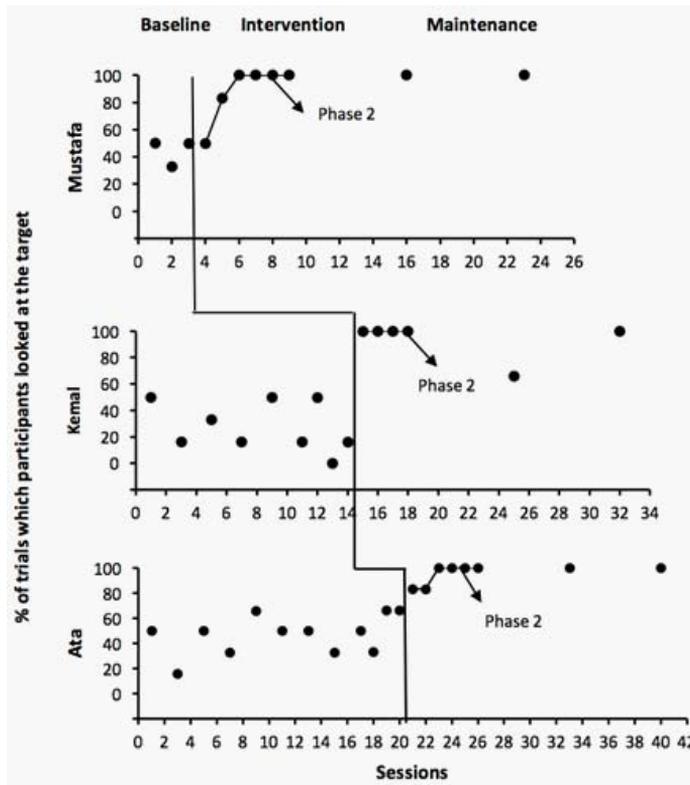
Inter-observer agreement (**IOA**) and procedural integrity data were collected during at least 20% of each experimental condition selected randomly. Point by point method formula was used to calculate the IOA [21] and analyses showed 100% agreement for Mustafa and Kemal and 98% agreement (range = 94%-100%) for Ata across all experimental sessions.

Procedural integrity data were analyzed by dividing the number of observed instructor behaviors by the number of planned instructor behaviors, multiplied by 100 [22]. The instructor showed 91% compliance during baseline (range = 89%-91%) and intervention sessions (range = 90%-93%) and 92% and 98% compliance during generalization sessions (range = 89%- 97%) and maintenance sessions (range = 97%-100%) respectively across the participants.

## RESULTS

### Acquisition and Maintenance Findings: Looking at the Target Stimulus in Response to the Instructor's Point

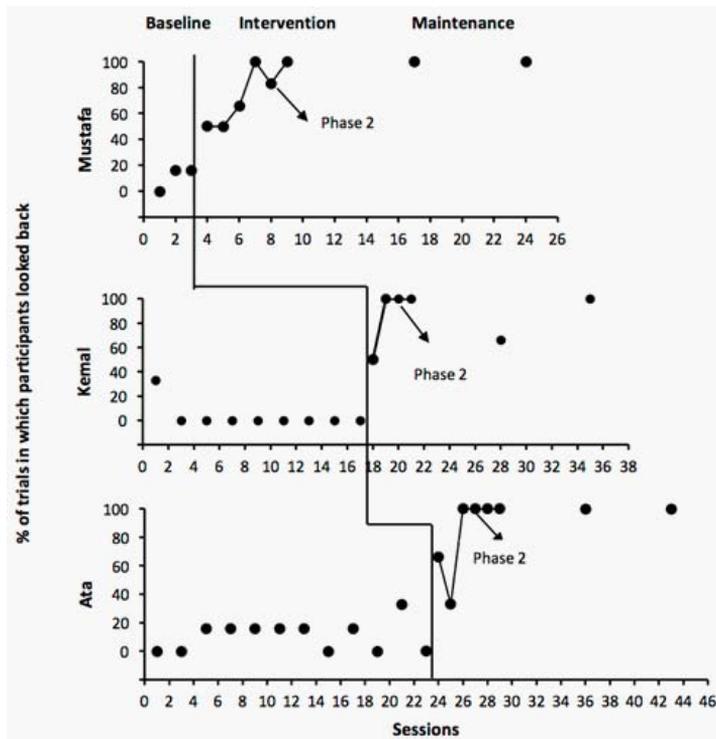
Acquisition and maintenance data on looking at the target object/event in response to the instructor's point are presented in Figure 1. Mustafa looked at the object/event at 44% (range= 33%-50%) of the opportunities during baseline. He reached criterion in three sessions. A total of 18 sessions (12 sessions for the first and 6 sessions for the second phase) and 324 trial were conducted with Mustafa. Kemal's performance was 27.4% (range= 0%-50%) during baseline and he reached criterion immediately during intervention. A total of 11 sessions (9 sessions for the first and 2 sessions for the second phase) and 198 trials were conducted with Kemal. Ata looked at the target stimulus at 46.9% (range= 16%-66%) of the opportunities during baseline. He reached criterion in three sessions. A total of 17 sessions (9 sessions for the first and 8 sessions for the second phase) and 306 trials were conducted with Ata. All but one participant maintained the skill of looking at the target stimulus with an average of 100% during follow-up. Kemal had 66% and 100% accuracy during the first and second follow-up sessions respectively.



**Figure 1:** Percentages of trials in which participants looked at the target stimulus.

### Acquisition and Maintenance Findings: Looking Back at the Instructor

Acquisition and maintenance data on looking back at the instructor are presented in Figure 2. Mustafa looked back at the instructor at 10.6% (range= 0%-16%) of the opportunities at baseline. He reached the criterion in four sessions. Kemal's performance was 3.6% (range= 0%-33%) during baseline and reached the criterion in two sessions. Ata looked at the target object/event at 10.7% (range= 0%-33%) of the opportunities at baseline and reached the criterion in three sessions. All but one participant maintained the skill of looking back at the instructor at 100% level during the fourth as well as sixth week. Same as the first dependent variable, Kemal's performance was 66% during the first and 100% during the second follow-up session.



**Figure 2:** Percentages of trials in which participants looked at the target stimulus.

## Generalization Findings

Generalization performances of the participants regarding looking at the object/event pointed by the individual were 33% for Mustafa and Kemal and 66% for Ata. The posttest performances of all participants reached 100% accuracy. Pretest generalization level for looking back at the instructor was 16% for all participants and posttest generalization data revealed an 83% correct responding rate for all participants.

## Social Validity Findings

### Normative comparison findings

The descriptive data analyses for subjective evaluation revealed that all mothers were pleased with this intervention as well as the results of the intervention in general. They all thought that RJA was an important skill for their children, teaching RJA should be included in the individualized educational plan (IEP) of their children, and their children learned the RJA skill during this research effort. Moreover, they all were pleased with the LMP procedure utilized in the study, the format of the intervention where the intervention took place as an extra-curricular activity in school, and the type of the objects/events used during intervention. All mothers stated that this intervention increased their children's attention and communication. Furthermore, there was not anything that they did not like in the study.

Normative comparison findings. We compared the RJA performances of the participants with the RJA performances of a reference sample consisting of four preschool children. Although there were considerable differences between the participants' pretest performances and their peers' performances, posttest performances of almost all participants were 100%, just like the performances of their peers. One exception was Mustafa's performance regarding looking back at the instructor during posttest. However, this exception was above the criterion as well.

## DISCUSSION

The purpose of this study was twofold: to investigate the efficacy of the LMP procedure on acquisition, maintenance, and generalization of RJA skills by four children with ASD, and to examine the social validity of the RJA skills of these children by both subjective evaluation and social comparison. For each research question key findings and limitations will be discussed and suggestions for future research and implications for practice will be highlighted in this section.

Our data showed that LMP procedure was effective on the acquisition, maintenance, and generalization of RJA skills by children with ASD. These findings are consistent with the findings of the study conducted by Taylor and Hoch [14] and enhance the literature about teaching RJA skills to children with ASD. With regards to social validity, positive findings were obtained from both subjective evaluation and normative comparison data. The differences between the participants and their typically developing peers almost disappeared after RJA skill intervention. Moreover, subjective evaluation findings obtained from mothers of the participants were very positive in general and consistent with the previous studies [e.g., 23,24].

In several studies investigating the effects of teaching JA skills, interventions are conducted in structured teaching environments by using discrete trial teaching [e.g., 25]. As opposed to those studies, RJA skill instruction was delivered in a natural school environment by creating natural scenes in this study. High levels of structure and difficulties of generalization are two frequently stated criticisms towards using behavioral interventions [e.g., 26]. When these criticisms are considered, delivering RJA intervention during natural teaching trials should be regarded as a strength of the study.

Meindl and Canella-Malone [27] reviewed 18 studies designed for teaching JA skills to children with ASD. Social validity was examined in only six of these studies. Among the studies where social validity was evaluated, subjective evaluations were conducted in two and normative comparisons were conducted in three of them. Only Rocha, Schriebman and Stahmer [24] examined social validity of their study via both subjective evaluation and normative comparison. Thus, evaluating social validity via subjective evaluation and normative comparison can be considered as another strength of the study since it is well known that examining only subjective evaluation has several limitations.

Procedural reliability findings of the study can be regarded as the other strength of the study. Although the study was conducted with young children in a complex natural environment and with a complex prompting hierarchy, the procedural reliability was found to be at ideal level.

This study was conducted at a university unit during out of class times such as snack time, play time, recess time, and participants' arrival to the unit. Sometimes there were too many people around the participants during intervention. It can be argued that intervention may have been affected negatively under these circumstances. For example, upon instructor's JA bid, the participant looks at the pointed object/event but turned his eyes towards the direction where there are other people rather than looking back at the instructor in some trials. During such occasions, the instructor terminated the trial and initiated the next one. Considering the possibility of such distracters, the instructor prepared more training materials than she needed as a procedural safeguard and used them during additional teaching trials as well as probe trials.

A number of limitations of the current study bear noting. First of all, the study was limited with teaching RJA skills via LMP procedure. It could be argued that the distracters used during the experimental sessions may have had some negative effects on the target behaviors. One can also argue that the norm group data obtained for making social comparison were limited since these data were collected from only four typically developing children.

Based on the results of and our observations during the study, as well as the discussion provided above, the following suggestions can be stated for future research. Researchers may consider conducting similar studies in different settings such as home environments to test the effectiveness of the intervention in other settings. The same study can be replicated by using distressing or fear-provoking stimuli to compare the effects of various training materials on the acquisition of RJA skills in children with ASD. Researchers can be advised to investigate the effects of other response prompting procedures on the acquisition of RJA skills by children with ASD. The effects of teaching JA skills can be tested on communication skills of children with ASD in the future studies. Moreover, investigating the effects of RJA teaching on the acquisition of IJA skills of children with ASD can be recommended.

With regards to the practical implication of the study, professionals who work with children with ASD as well as parents, peers and/or other caregivers can be advised to include teaching JA skills via LMP.

In conclusion this study indicates that LMP procedure is effective in teaching RJA skills to three children with ASD. JA is a core skill for the development of communication and social interaction whereas LMP is a cost effective procedure. Hence, it is advisable to use this type of procedures in schools, home settings, and other community settings by professionals as well as nonprofessionals (e.g., parents, peers).

# ACKNOWLEDGEMENT

This study was supported by a Grant from Anadolu University Research Fund (Project No: 1305E080).

## References

1. Bruinsma Y, Koegel RL, KoegelLK. Joint attention and children with autism: A review of the literature. *Mental Retardation and Developmental Disabilities Research Reviews*. 2004; 10: 169-175.
2. Dube WV, MacDonald RPF, Mansfield RC, Holcomb WL, Ahearn WH. Toward a behavioral analysis of joint attention. *The Behavior Analyst*. 2004; 27: 197-207.
3. Jones EA, Carr EG. Joint attention in children with autism: Theory and intervention. *Focus on Autism and Other Developmental Disabilities*. 2004; 19: 13-26.
4. Morales M, Mundy P, Delgado CEF, Yale M, Messinger D, et al. Responding to joint attention across the 6-through 24-month age period and early language acquisition. *Journal of Applied Developmental Psychology*. 2000; 21: 283-298.
5. Mundy P, Block J, Delgado C, Pomares Y, Hecke AVV, et al. Individual differences and the development of joint attention in infancy. *Child Development*. 2007; 78: 938-954.
6. Yoder PJ, McDuffie AS. Treatment of responding to and initiating joint attention. In: T Charman (ed.), *Social and Communication Development in Autism Spectrum Disorders: Early identification, diagnosis, and intervention*. 2006; 117-142.
7. Meins E, Fernyhough C, Arnott B, Vittorini L, Turner M, et al. Individual differences in infants' joint attention behaviors with mother and a new social partner. *Infancy*. 2011; 16: 587-610.
8. Hecke AVV, Mundy P, Block JJ, Delgado CEF, Parlade MV, et al. Infant responding to joint attention, executive processes, and self-regulation in preschool children. *Infant Behavior and Development*. 2012; 35: 303-311.
9. Carpenter M, Nagell K, Tomasello M. Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development*. 1998; 63: 255.
10. Charman T. Why is joint attention a pivotal skill in autism? *Philosophical Transactions of the Royal Society*. 2003; 358: 315-324.
11. Naber FBA, Makermans-Kranenburg MJ, van Ijzendoorn MH, Dietz C, van Daalen E, et al. Joint attention development in toddlers with autism. *European Child and Adolescent Psychiatry*. 2008; 17: 143-152.
12. Whalen C, Schreibman L. Joint attention training for children with autism using behavior modification procedures. *Journal of Child Psychiatry and Psychology*. 2003; 44: 456-468.
13. Martins MP, Harris SL. Teaching children with autism to respond to joint attention initiations. *Child and Family Behavior Therapy*. 2008; 28: 51-67.
14. Taylor BA, Hoch H. Teaching children with autism to respond to and initiate bids for joint attention. *Journal of Applied Behavior Analysis*. 2008; 41: 377-391.
15. Isaksen J, Holth P. An operant approach to teaching joint attention skills to children with autism. *Behavioral Interventions*. 2009; 24: 215-236.
16. Sheinkopf SJ, Mundy P, Claussen AH, Willoughby J. Infant joint attention skill and preschool behavioral outcomes in at-risk children. *Development and Psychopathology*. 2004; 16: 273-291.
17. Murza AK, Schwartz JB, Haahs-Vaughn DL, Nye C. Joint attention interventions for children with autism spectrum disorder: A systematic review and meta-analysis. *International Journal of Language & Communication Disorders*. 2016; 51: 236-251.
18. American Psychiatric Association *Diagnostic and statistical manual of mental disorders (4th ed., Text Revision)*. Washington, DC: Author. 2000.
19. Kennedy CH. *Single-case Designs for Educational Research*. Boston: Allyn& Bacon. 2005.
20. Van Houten R. Social validation: The evolution of standards of competency of target behaviors. *Journal of Applied Behavior Analysis*. 1979; 12: 581-591.
21. Tawney JW, Gast DL. *Single Subject Research in Special Education*. Columbus, OH: Merrill. 1984.
22. Billingsley F, White OR, Munson R. Procedural reliability: A rationale and an example. *Behavioral Assessment*. 1980; 2: 229-241.
23. Jones EA, Carr EG, Feeley KM. Multiple effects of joint attention intervention for children with autism. *Behavior Modification*. 2006; 30: 782-834.

24. Rocha ML, Schreibman L, Stahmer AC. Effectiveness of training parents to teach joint attention in children with autism. *Journal of Early Intervention*. 2007; 29: 154-172.
25. Jones EA, Feeley KM. Parent implemented joint attention intervention for preschoolers with autism. *The Journal of Speech-Language Pathology and Applied Behavior Analysis*. 2007; 2: 253-268.
26. Simpson RL. *Autism Spectrum Disorders: Interventions and Treatments for Children and Youth*. Thousand Oaks, CA: Corwin Press. 2005.
27. Meindl JN, Canella-Malone HI. Initiating and responding to joint attention bids in children with autism: A review of the literature. *Research in Developmental Disabilities*. 2011; 32: 1441-1451.