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# Using Contingency Mapping to Decrease Problem Behavior and Increase Social Communication Skills in Children with Autism

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Using Contingency Mapping to Decrease Problem Behavior and Increase Social  
Communication Skills in Children with Autism

by

Diana Sanguino

A thesis submitted in partial fulfillment  
of the requirements for the degree of  
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## **Abstract**

Social communication skills play a central role in the developmental outcomes for young children with autism. Due to deficits in social communication skills, many young children with autism develop problem behavior. Providing these children with the right tools to communicate properly may decrease their problem behavior. This study examines the impact of contingency mapping intervention on problem behavior and functional communication skills in three children with autism, using a multiple-baseline design. Before implementation of contingency mapping, verbal contingency was implemented in the first phase of intervention, which was associated with minimal increases in communication skills and decreases in problem behavior across children. Further increases in communication skills and decreases in problem behavior in the contingency mapping condition indicate that the use of the contingency map as a visual aid may be an effective way to augment the effects of contingency instruction.

## **Introduction**

It is widely known that children diagnosed with autism have deficits in social communication. Due to deficits in this area, children with autism are at risk for developing problem behavior (Brown & Mirenda, 2006; Delano & Snell, 2006;). A considerable amount of empirical studies indicated that problem behavior in children with autism and other related developmental disorders often had communicative functions, and if children's functional communication skills were improved, there would be a decrease in problem behavior (Davis, Frederick, Alberto, & Gama, 2012; Durand & Carr, 1991; Falcomata, Roane, Muething, Stephenson, & Ing, 2012; Hanley, Iwata, & Thompson, 2001; Horner, Carr, Strain, Todd, & Reed, 2002; Kuhn, Chirighin, & Zelenka, 2010).

Considering the fact that problem behavior in children have a tendency to worsen with time and would likely negatively impact the social aspects of a child's life if no intervention is implemented (White, Keonig, & Scahill, 2007), improving functional communication skills is imperative for these children (Horner et al., 2002; Moes & Frea, 2000). The empirical support for functional communication skills is strong (Hagopian, Kuhn, Long, & Rushm 2005; Leon, Hausman, Kahng, & Becraft, 2010' Moes & Frea, 2000).



Problem behaviors often function to gain escape from demands or access to social attention (Carr & Durand, 1985; Carr & Durand, 1991; Koegel, Koegel, Hurley, & Frea, 1992). Children with autism are frequently exposed to learning situations that might become aversive and establish escape from tasks as a negative reinforcer. Durand and Carr (1991) evaluated the effect of functional communication training with three boys with developmental disabilities. The results indicated that when the children's problem behavior was maintained by escape due to difficult tasks or gaining access to attention, teaching the children to request assistance or to obtain attention led to a rapid decrease in problem behavior. There is compelling evidence that teaching functionally equivalent responses is an effective intervention in addressing problem behavior in young children with autism (Dunlap & Fox, 1999).

Research indicates that many children with autism have strong visual skills (Charlop-Christy & Kelso, 2003; Delano & Snell, 2006; Keeling, Myles, Gagnon, & Simpson, 2003; Sarokoff, Taylor, & Poulson, 2001). Several visual prompts have been used in the literature to teach children with autism a variety of skills and address their problem behavior. These strategies include photographs (Bryan & Gast, 2000; Thiemann & Goldstein, 2001; West, 2008), picture symbols (Brown & Mirenda, 2006; Bryan & Gast, 2000; Delano & Snell, 2006), daily schedules (Clarke, Dunlap, & Vaughn, 1999; Horner, Carr, Strain, Todd, & Reed, 2002), and Social Stories (Chan & O'Reilly, 2008; Delano & Snell, 2006; Schneider & Goldstein, 2010; Scattone, Tingstrom, & Wilczynski, 2006; Thiemann & Goldstein, 2001). A large number of studies demonstrated positive outcomes of visual strategies in helping children with autism adjust to routines, learn

appropriate communication and social skills, and reduce problem behaviors (Ganz, Kaylor, Bourgeois, Hadden, 2008).

For example, Bryan, and Gast (2000) successfully demonstrated the effectiveness of combining a visual activity schedule and graduated guidance to teach children with autism to independently engage in on-task and on-schedule behaviors and generalize these behaviors to novel routines. Their findings indicated that picture schedules improved appropriate task-related behaviors. Studies on Social Stories demonstrated that teaching appropriate responses to specific visual social cues using social stories were beneficial to children with autism in increasing social interactions with peers and decreasing problem behaviors (Delano & Snell, 2002; McConnell, 2002; Scattone, Tingstrom, & Wilczynski, 2006).

A new visual strategy that has been evaluated in the literature is contingency mapping. Contingency maps graphically depict both the current and alternative antecedent-behavior-consequence pathways related to problem behaviors (Brown & Mirenda, 2006). The features of contingency maps were based on the framework of the Competing Behavior Pathways model used in designing function-based intervention (O'Neill et al., 1997). Brown and Mirenda (2006) examined the effect of contingency mapping with a 6-year-old child with autism spectrum disorder (ASD) who did not initiate task performance independently in the school and whose problem behavior was maintained by escape from task demands or difficult activities. The child was provided with three contingency maps that included the antecedents, behaviors, and consequences or reinforcement. At the beginning of the study, the child engaged solely in prompt-dependent behavior. The study showed that contingency mapping was more effective

than verbal contingencies in reducing the problem behavior and teaching functional communication skills.

Brown and Mirenda's study was the only peer-reviewed evaluation of the outcome of contingency mapping thus far. Although Brown and Mirenda (2006) effectively addressed problem behaviors and taught a child with autism functional communication skills in a school setting, there were several limitations to their study. One of the limitations was limited follow-up data; the researchers collected follow-up data one and two weeks after termination of intervention. Follow-up at a later time would have provided more information in regards to the maintenance of the treatment. Another limitation of their study was no assessment of generalization effects. In this study, the generalization probes were conducted in playroom, where there was free access to reinforcers. Problem behaviors were low in this environment. Future research should conduct generalization probes in routines with more control similar to that in the intervention. A common characteristic of children with developmental disabilities, including children with autism is difficulty in generalizing skills learned during therapy or individual instruction to functional use in natural daily routines (Kaiser & Trent, 2007; Stahmer, 1995). Although the use of skills should be improved by facilitating generalization, research seldom involved multiple interventionists and embedded opportunities to promote children to learn and use skills across settings (Kaczmarek, Hepting, & Dzubak, 1996; Kaiser & Hester, 1994).

Therefore, the purpose of this study was to further examine the potential efficacy of contingency mapping in addressing problem behavior and teaching functional communication skills to children with autism. The study replicated the study by Brown

and Mirenda (2006) and extended the literature on contingency mapping by assessing the generalization effects of intervention. In addition to assessing the general outcome of contingency mapping in reducing problem behavior and teaching functional communication skills, the study was conducted with a greater number of participants. The study addressed the following questions:

1. To what extent will contingency mapping be effective in reducing problem behavior and increasing functional communication skills of children with autism?

2. To what extent will the children with autism generalize skills acquired through the use of contingency mapping during discrete trial training to untrained natural playtime?

## **Method**

### **Participants and Setting**

Three children with autism participated in the study. The children met the following criteria: (a) had a diagnosis of autism; (b) tacted (labeled) visual symbols; (c) had difficulty expressing needs and wants using verbal expressive communication skills; and (d) displayed problem behavior during individual therapy sessions. The children's diagnosis was obtained through a diagnostic report that was provided to the clinic during the initial assessment. All child participants were recruited from among children who received Applied Behavior Analysis (ABA) therapy at a local verbal behavior clinic.

IA was five years old female diagnosed with autism at age 3. At the time of the study, IA was receiving 10 hours of direct ABA therapy per week at the clinic. During her sessions, she engaged in severe screaming which inhibited her acquiring new skills. She was able to communicate in 2-3 word phrases or sentences. She engaged in problem behavior when presented with non-preferred tasks and when given directions such as "do this" or "say". Due to her limited verbal communication skills, she had difficulty expressing her wants and needs.

GS was 13 years old male at the beginning of the study. He was diagnosed with autism at the age of 3. He was in a middle school in a special education classroom. GS was receiving 15 hours of direct ABA therapy per week at the clinic. He communicated with up to five word sentences and could follow three- step directions. However, he

engaged in banging objects or laughing during therapy sessions, particularly when being prompted to respond to instructional trials.

EH was 5 years old male at the beginning of the study. He was diagnosed with autism at age 3. He was receiving 10 hours of direct ABA therapy per week at the time of the study. He communicated with 2-3 word phrases and sentences, but had difficulty expressing his needs and wants. He engaged in pica, aggression, and getting out of his seat during therapy sessions. He also did not ask appropriately for a break.

This study was conducted at a local verbal behavior clinic providing behavior therapy to children with autism. Intervention was implemented during regularly scheduled therapy sessions where problem behavior occurred at high rates. During therapy, the therapist worked one-on-one with the individual child and provided instructions to facilitate skill acquisition, using discrete trial training. In addition to discrete trial training, the children were also taken to a natural environment training room to evaluate generalization of the intervention. In this setting, children engaged in free play activities with peers in which the therapist followed the child's motivation and engaged in verbal interaction through the use of manding and natural environment training procedures. Three therapists who were graduate students of ABA master's program delivered the therapy sessions. The therapists had a minimum of one-year experience working with children with autism, implementing verbal behavior therapy, and discrete trial training procedures at the clinic. They had an in-depth training in providing therapy, and completed a competency assessment every month to ensure that they were performing appropriately.

## **Target Behaviors**

Prior to the study, the behavior analysts in the clinic created a behavior plan for all children in the clinic. Each behavior plan included the target behaviors used in this study along with their functions that were determined by collecting systematic direct and indirect functional behavior assessment procedures including collecting A-B-C data. In this study, each participant's target behaviors and functions were identified and confirmed through reviews of their behavior plans, therapist inputs, and researcher observations during the targeted therapy sessions.

The study targeted child problem behavior and functional communication skills for intervention and measured the percentage of intervals of problem behavior and rate per minute of communication skills (communicative behavior). IA's target problem behavior was screaming. Her screaming was defined as each instance of loud, high-pitched scream or yell. Her communication skills were asking for playroom, asking for help, or requesting an edible. The communication skills were defined as using a one-word verbal expression, saying, "playroom", "help", or "popcorn" to request break from work, help with task, or edible reinforcer. If she requested playroom, she was given approximately 5 min to play in the playroom before returning to the table.

GS's target problem behaviors were banging and non-contextual laughing. Banging was defined as an attempt of actual forceful contact with a surface while the fist is closed and is able to be heard from 10 feet away. His non-contextual laughing was defined as laughing without an appropriate discriminative stimulus for laughing. His target communicative skills were asking for a break, asking for gummy bears or water drops, or asking for free time with reinforcer, such as iPad or iPod.

EH's target problem behaviors were getting out of his seat and non-compliance. Getting out of his seat was defined as leaving his seat during trials. His non-compliance was defined as each episode of 3s or more of not complying with demand. This included refusing to answer questions, flopping on the floor, or sitting on the table. His communicative skills were defined as asking for a break, asking for the vacuum, or asking for preferred edible items using a one word verbal expression, such as saying, "break", "vacuum", or "Skittle."

### **Treatment Fidelity**

As suggested in the literature (Duda, Clarke, Fox, & Dunlap, 2008; Sears, Blair, Iovannone, & Crosland, 2012), steps needed to implement the intervention were measured to assess treatment fidelity. Therapists' implementation of the sessions were video recorded for later scoring to assess the treatment fidelity. A yes/no checklist was utilized to measure the treatment fidelity (see Appendices C and D). Fidelity was calculated as a percentage based on the number of correct steps implemented. Fidelity was assessed during the first three sessions in each phase of intervention and approximately 30% of the remaining sessions. During the verbal contingency phase, implementation fidelity was 100% across therapists. In the contingency mapping phase, implementation fidelity was above 95% across therapists.



## **Social Validity**

Social validity was measured by having the therapists complete the questionnaire following the intervention. The social validity questionnaire was adapted from the Treatment Acceptability Rating Form Revised (TARF-R; Reimers & Wacker, 1988). TARF-R uses a 5-point Likert-type scale in which 1=strongly disagree and 5= strongly disagree (see Appendix B). The questionnaire assessed the likeability, willingness to implement, confidence in utilization, disadvantages, implementation time, ability to decrease behavior, likelihood of continued usage, amount of undesired effects, the ability of the intervention to increase communication, acceptability, and difficulty of the contingency map intervention. It also assessed the therapist's willingness to change routines for the behavior plans and how well they thought the intervention fit with the current routines of their client.

## **Data Collection and Interobserver Agreement (IOA)**

All sessions were recorded for later scoring. Child target behaviors were observed 2-5 times per week during 20-30-minute sessions. Frequency was collected during one-minute intervals for communicative behaviors, which was converted to rate per minute. The measure of problem behavior was based on the percentage of the one-minute intervals where the behaviors occurred. A partial interval recording system was used to record the problem behavior. Interobserver agreement (IOA) percentages were obtained during approximately 35% of sessions in each phase. A trained research assistant, who was a graduate student in the ABA Master's Program, independently viewed and scored videotaped data. IOA was calculated using an interval-by-interval method, by dividing the number of agreements by the number of agreements plus disagreements, multiplied

by 100. An agreement for problem behavior was if both observers scored a yes or a no. For communication skill, it was an agreement if both observers got the same frequency within the interval. If the frequency differed, there was a 50% agreement. For IA, mean IOA was 98% (range 90-100) across target behaviors and phases. For GS, mean IOA was 98% (range 90-100) across target behaviors and phases. For EH, mean IOA was 97% IOA (range 90-100). For treatment fidelity, IOA was 100% across verbal contingency and contingency mapping phases.

### **Design**

A non-concurrent multiple baseline design across children was used in the study to evaluate the intervention. The design included four phases: (a) baseline, (b) verbal contingency, (c) contingency mapping, and (d) generalization.

### **Procedures**

During all phases of the intervention, therapists used the same prompting procedures. Prompting was used to ensure success in the children's targets. When there was an error in the response, a discriminative stimulus was presented again and the response was reinforced for the child to repeat. A transfer trial was then conducted by presenting the discriminative stimulus once more to promote the child's independent responding. Contingent reinforcement was provided to the child upon the completion of tasks. At the table, both EH and IA were presented with demands through target cards. Target cards are used to help the children practice skills through all the verbal operants. GS had different activities. He engaged in math worksheets, reading comprehension along with target cards.

**Baseline.** During baseline, the therapists interacted with the child participants as they would normally do during a session. Baseline data were collected during 20-30 minutes of individual therapy sessions where child fine motor, social communication, behavioral, academic, play, and self-help skills were taught using discrete trial procedures. Reinforcers varied depending on child's preference; the most common reinforcers were edibles and iPad. If the child engaged in problem behavior, the child was prompted to continue working, or attention to the problem behavior was briefly withdrawn.

**Preference Assessment.** Prior to every intervention session, a brief preference assessment was conducted to identify the reinforcer each child was working for by providing children with the opportunity to select reinforcers. For the verbal contingency, a multiple-stimulus presentation procedure was used in which the children were allowed to select any reinforcers. For the contingency mapping phase, the maps were designed with the top three reinforcers for the children.

**Intervention.** The first phase of the intervention involved implementation of verbal contingency. The second phase involved implementation of contingency mapping. Before implementing intervention, the researcher developed contingency maps with therapists and provided training on implementation of the intervention procedures.

***Contingency Map Design and Therapist Training.*** Following baseline, contingency maps were developed for each child based on the hypothesized function(s) of their problem behavior. Both the researcher and each therapist working with each target child developed appropriate contingency maps to address identified behavioral functions. For all three children, individual behavior intervention plans and observations by the therapists indicated that their problem behaviors during therapy sessions were

primarily maintained by escape from task demand. Gaining access to tangible items, edibles, or attention were found to be the secondary maintaining variables. Two contingency maps (e.g., one for escape, one for tangibles) were created for each child. Each contingency map contained five cells with pictures representing each component of the map, along with text containing short descriptions (Brown & Miranda, 2006). The first cell on the left side of each map contained a picture representing the common antecedent stimuli (e.g., presentation of tasks or directions) for problem and replacement communicative behavior. The following branched off from the antecedent cell: (a) two cells representing the child engaging in the problem behavior and related consequences and (b) two cells representing the child engaging in the replacement behavior and related consequences (see Appendix A for an example). The contingency maps were printed on 8.5x11-in. laminated paper. The contingency maps were placed on the cubicle wall of the therapy room. Refer to Appendix A for sample. The researcher provided therapists with 30-min training to help them implement both verbal contingency and contingency mapping procedures with fidelity. Researcher used modeling and role-play procedures while providing feedback on their correct and incorrect performance during training.

***Verbal Contingency.*** During this phase, the child was told that it was time to start the therapy sessions. At the beginning of each session, the child's therapist verbally stated the contingencies associated with both the problem and replacement behaviors. They told the child the contingencies associated with the replacement communicative behavior, including the antecedent, replacement behavior, and the positive consequences for engaging in the behavior (e.g., "If you do your work with nice hands and say 'playroom' with nice voice, and you will get playroom"). The therapist also told the child

the consequences associated with the problem behavior (e.g., “If you don't complete your work and kick me, then you will not play.”). The desired path was reiterated, so that the child would have opportunities to learn the replacement behaviors. After the verbal contingency was presented, the child was prompted to engage in the activity. If the child engaged in target problem behaviors, the adults ignored these behaviors. If the child got back to the activity and followed the path of the replacement behavior, the adults provided verbal praise and provided to the child with what was requested. If the child engaged in problem behavior for over two minutes, the therapist used the verbal contingency to prompt the child to use the target communicative skills or complete the activity.

***Contingency Mapping.*** Prior to implementing the contingency mapping, each picture was presented to each child to ensure that the child could tact (label) the picture. During this phase, the therapist first showed the child the contingency map associated with each activity as they also verbally stated the different pathways. The verbal stimulus provided was the same that was used during the verbal contingency phase. The only difference in the phase was the visual stimulus presented and the adults pointing to each picture as they reviewed the contingencies. If the child used target communication skills, the adults immediately provided the child with verbal praise and what was requested. If the child engaged in target problem behaviors, the therapist ignored these behaviors. If the child engaged in problem behavior for over two minutes, the therapist used the contingency map to prompt the child to use the target communication skills or complete the activity or routine. The contingency maps were placed on the table or wall to ensure that they are in the child's view during the session.

**Generalization.** To evaluate generalization of children's responses in a novel setting, probing data on the children's target behaviors were collected across baseline and intervention phases during a novel playtime with peers and therapists in the natural playroom. The playroom was composed of play materials for the children, such as trampolines, ball pits, board games, and electronic toys. In the playroom, each target child was allowed to engage in free choice activities with peers while receiving prompts and verbal complements from a therapist who followed the child's lead and engaged in play with the child's preferred items. The therapist verbally prompted the child to engage in play activities without provision of verbal contingency and visual contingency mapping strategies.

## **Results**

### **Problem Behavior**

Figure 1 presents the percentage of problems behavior and rate of communicative behavior for each child. Data indicate that the contingency mapping was successful in decreasing problem behavior substantially for all three children. As shown in in Figure 1 during baseline, IA engaged in high levels of problem behavior. The mean percentage of intervals of problem behavior for IA was 67%, with a range of 30% to 80% across all sessions. Her data showed a high variability. During the verbal contingency phase, her problem behavior dropped to 47% with a range of 14% to 76%. Initially, her problem behavior decreased rapidly; however, it increased to the baseline level in the last two sessions of this phase. When contingency mapping was introduced, IA's problem behavior dropped to 3% across sessions with a stable pattern. Due to a scheduling change, further data could not be taken for the contingency mapping.

The mean percentage of intervals of problem behavior for GS was 22%, ranging from 3% to 63% during baseline. There was a slight decrease to 17.5% during the verbal contingency phase, ranging from 0% to 30%. However, the data clearly showed an upward trend. As sessions progressed, GS's problem behavior increased. In the second phase of intervention when contingency mapping was implemented, his problem behavior dropped to 0% across all five sessions. Table 1 presents mean percentage of intervals of problem behavior across participants and experimental phases.

EH also exhibited problem behavior an average of 44%, with a range of 0% to 87% during baseline. His problem behavior was highly variable during this phase. During verbal contingency, EH's problem behavior decreased to 24%, with a range of 0-80%. During contingency mapping, his problem behavior dropped to 3% ranging from 0-10%.

### **Communication Skills**

For all children, the use of communication skills rarely occurred in baseline. In verbal contingency, IA and GS did not use any communication skills. EH's communication skills increased from zero to 0.9 per minute during verbal contingency; however, it showed a decreasing trend as sessions progressed. In contingency mapping, both IA and GS demonstrated increases in communication skills. The communication skills were on average at a rate of 0.23 per min for IA and 1.1 per min for GS. GS demonstrated a substantial increase in his communication skill during contingency mapping. EH also demonstrated significant improvement. During the contingency mapping phase, his mean communicative skills were at 1.7 ranging from 1.1-2.8 per minute. Table 1 presents mean rate of communication skills across participants and experimental phases.

### **Generalization**

Figure 1 and Table 1 also present data on generalization probes. For all children, almost no or zero percentage of problem behavior occurred in all phases including baseline, except for one probe session during verbal contingency for IA. The replacement communication skills also rarely occurred across phases.



## **Social Validity**

The results of social validity assessment indicated that the contingency mapping intervention was acceptable, effective, and useful. The overall mean score for social validity was a 4.4 ranging from 3.8-4.7 across therapists. Regarding the difficulty of implementing the contingency mapping, therapists all agreed that the intervention was easy to implement, with a consistent rating score of 5. Regarding the efficiency of intervention, they also indicated that the intervention took little time to carry out with a mean score of 4.8. The mean score of how much they liked the intervention was a 4. They also all scored a 4 for the effectiveness in teaching communicative skills. The therapists indicated that they would be willing to utilize the contingency mapping again with other clients.

Table 1.

Mean Percentage of Problem Behavior and Rate of Communication Skills

| Phase                  | Problem Behaviors |                  |                | Communication Skills |                   |                   |
|------------------------|-------------------|------------------|----------------|----------------------|-------------------|-------------------|
|                        | IA                | GS               | EH             | IA                   | GS                | EH                |
| Baseline               | 67%<br>(30-80%)   | 22%<br>(3-63%)   | 44%<br>(0-87%) | 0.03<br>(0-0.06)     | 0.07<br>(0-0.2)   | 0.05<br>(0-0.1)   |
| Verbal<br>Contingency  | 47%<br>(14-76%)   | 17.5%<br>(0-30%) | 24%<br>(0-80%) | 0.06<br>(0-0.3)      | 0.05<br>(0-0.13)  | 0.52<br>(0.2-0.9) |
| Contingency<br>Mapping | 3%                | 0%               | 3%<br>(0-10%)  | 0.81<br>(0.2-0.23)   | 0.85<br>(0.5-1.1) | 1.7<br>(1.1-2.8)  |
| Generalization         | 2%                | 0                |                | 0                    | 0                 | 0                 |

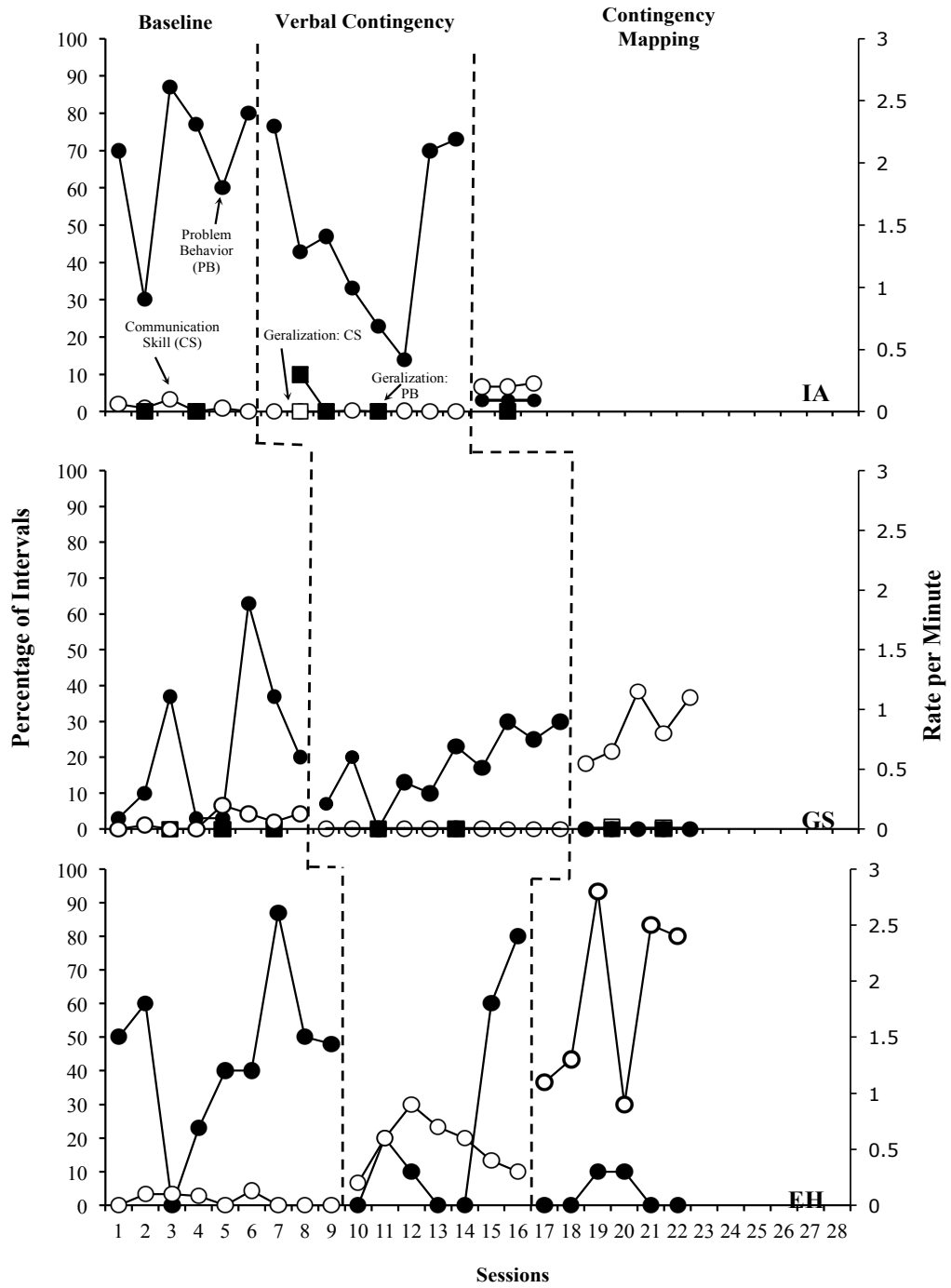


Figure 1. Percentage of intervals of child problem behavior and rate per minute of communication skills across experimental phases and conditions.

## **Discussion**

Major findings of the present study indicate that problem behavior could significantly be reduced using contingency mapping. Virtually, the problem behavior decreased to nearly zero levels across children during contingency mapping. On the other hand, in the verbal contingency phase, a high degree of variability or gradual increase in problem behavior was observed after initial decreases. It is clear that effects of verbal contingency alone were far from optimal. As indicated in the literature, the use of visual aid could have a significant impact on problem behavior in children with autism compared to relying on verbal, auditory stimuli only (Schneider & Goldstein, 2009). Providing a verbal contingency of what should be done to obtain desired reinforcer did not result in continued decreases in problem behavior in all children. However, when contingency mapping was introduced, immediate decreases in problem behavior occurred, and data were stable over the course of intervention phase. In the present study, the contingency maps were placed within the child's view during the session after reviewing the map at the beginning of the session, which was used as a visual reminder. The results clearly demonstrate that contingency mapping was more effective than verbal contingency in reducing the problem behavior as found in the study by Brown and Mirenda (2006). The results also indicated that contingency mapping was effective in increasing replacement functional communication skills for all children. Compared to

baseline and verbal contingency phases, during contingency mapping, all children's communication skills increased.

The results of the study support the previous study on the use of concrete visual system to decrease problem behavior (Vaughn & Horner, 1995). In a study with an adult with autism and severe intellectual disabilities, Vaughn and Horner showed that when choices were made via pictures less problem behavior occurred while a high level of problem behavior occurred when choices were made verbally.

This study had several limitations. The study did not evaluate the different tasks presented to the children. O'Neill and Sweetland-Baker's (2001) suggested that the "characteristics of tasks presented may have increased problem behavior." When the videos were scored, it was observed that GS was more likely to engage in problem behaviors when presented with math problems. This is a limitation because some tasks presented evoked higher problem behaviors, therefore, had an adverse effect on the results. Future research should first pinpoint the routines that evoke higher problem behavior and utilize the intervention on these routines, which is related to a limitation of the current study; generalization probes were conducted during playtime in the playroom where no task demands were placed and access to reinforcers were readily available. Although therapists limited access to preferred items to promote spontaneous initiation of functional communication skills, the participating children rarely requested additional play items once they engaged in play with a preferred item.

The different therapists providing discrete trial training might have an impact on the percentage of problem behavior. In the current study, although the treatment fidelity was high among the three therapists, the way each therapist presented the verbal

contingency and contingency maps might have affected the children's behavior. Certain therapists may have better rapport and experience with the child and therefore, problem behavior may have been higher with some therapists than others. Future studies should implement the intervention with one therapist per child.

The current study only had one participant who was high functioning, limiting the generalizability of the intervention to the high functioning autism population. Further research could include more high functioning children. In addition, no data were collected in the home or school settings; therefore, generalization effects to other settings are unknown. Further research should address the maintenance and generalization by training the children's parents or other natural caregivers and the children's teachers.

In the current study, the sessions were lengthy, and having the child wait for the reinforcer could have been a factor in the occurrence of problem behavior. The length of reinforcement provided to each child varied based on their preferred reinforcer in each session. Time in the playroom may have been more effective as a reinforcer than an edible due to the length of time. Therefore, the length and quality of the reinforcers provided to participating children during contingency mapping should further be evaluated. Prior to future studies, a determined amount of time should be set with the reinforcer for more consistency. Also, setting a fixed amount of time would reduce the amount of time per session. The first sessions should be shorter in duration so that the participants understand the relationship between work and the reinforcer. Additional time could be added in the later sessions. This could also assist in the fading process.

One issue with implementing contingency to teach replacement functional communication skill was found to be the continued request for reinforcers by children. To

replace the problem behavior with functional communication skills, providing reinforcer immediately following the target communication skill was necessary. However, it would be difficult to help the natural caregivers understand the importance of delivering immediate reinforcer contingent on functional communication skills during the initial phase of intervention, and to train them to gradually delay the reinforcers. In the current study, once the children were aware that their appropriate behaviors would lead to the desired reinforcer, they would continuously ask for the reinforcer. Peterson et al. (2010) evaluated functional communication training where they taught children with autism to mand for breaks as a replacement for problem behavior. Similar to contingency mapping, they implemented functional communication training contingencies, where the participant could engage in task, problem behavior, or mand for break. The results indicated that when problem behaviors were put in extinction, mands for breaks increased. Peterson et al. concluded that “although FCT was successful in reducing the participants’ problem behavior, they essentially opted out of work altogether”. In the current study, there was also an increase in requests for reinforcer. This may decrease the acceptability of the intervention by natural caregivers in the long term. Therefore, using contingency mapping and functional communication training should include training caregivers to delay reinforcers or teach tolerance for delay of reinforcement (Fisher, Thompson, Hagopian, Bownman, & Krug, 2000).

The current study conducted a brief preference assessment at the beginning of each session to identify the reinforcer. When researching the effectiveness of a reinforcer, Peterson et al. (2010) “suggests that individuals’ choices are governed by various dimensions or reinforcement that are concurrently available for different response

alternatives.” Participant’s length of reinforcement varied based on their preferred reinforcer each session. Time in the playroom may have been more effective as a reinforcer than an edible due to the length of time. Communicative skills could have been lower due to a longer reinforcement time and the child becoming satiated with the reinforcer. Future research should ensure that time spent with reinforcer is of equal value.

Future research could also assess the social interaction between peers. In this study, the children mostly interacted with therapists. It would be useful to evaluate the impact contingency mapping has on social interaction between the children with autism and their peers in the natural environment. In future studies, contingency mapping should be compared to other forms of visual strategies to determine whether contingency mapping would lead to better outcomes for children with autism.

Despite limitations, this study is one of the first studies that used contingency mapping to teach communication skills and to reduce problem behavior of children with autism. While a large number of studies have demonstrated positive outcomes of visual support for children with autism (Koyama & Wang, 2011; Murdock & Hobbs, 2011), the potential efficacy of contingency mapping has rarely been evaluated in the literature. While Brown and Mirenda (2006) evaluated the use of contingency mapping for teaching communication skills of a child with autism, this study was the first to examine the outcome of contingency mapping with more than one child.

In conclusion, contingency mapping is effective in decreasing problem behavior in children with autism. The maps are cost-effective and easy to implement. This tool has the potential to assist therapists, parents, and teachers in their daily work with children with autism and produce more meaningful results.



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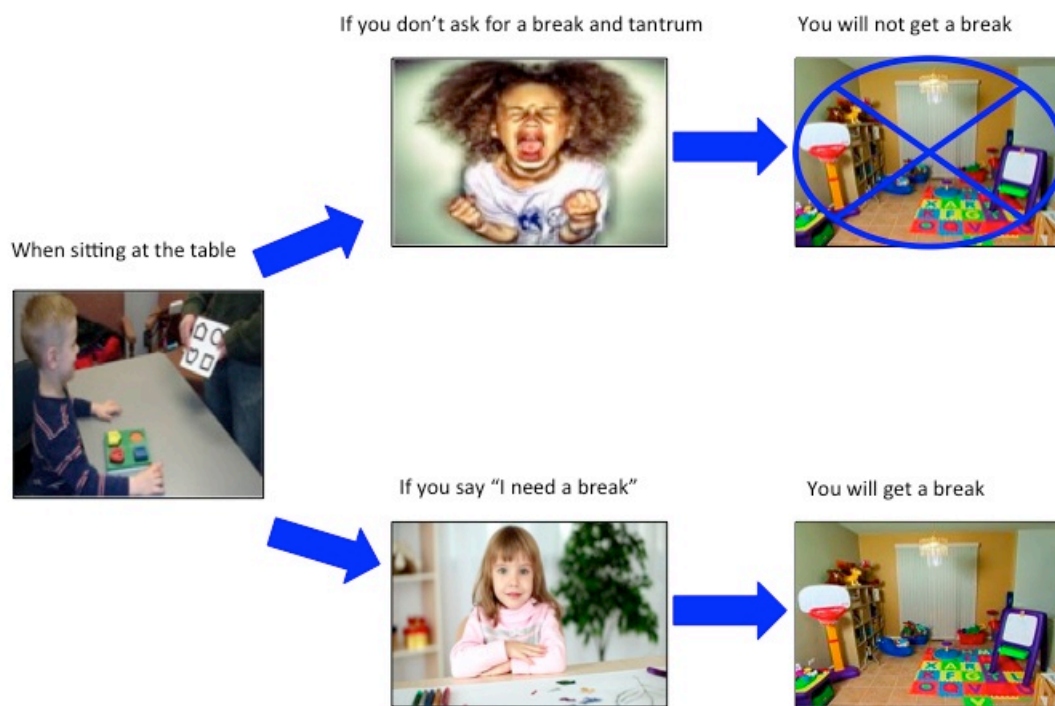
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# Appendix A

## Sample Contingency Map



## Appendix B

### Social Validity Rating Scale Form

*Please score each item by circling the number that best indicates how you feel about the contingency mapping intervention*

1. Given your child's behavior, how acceptable was the contingency mapping intervention?

1                      2                      3                      4                      5  
Not at all                      Neutral                      Very acceptable  
acceptable

2. How willing were you to carry out the intervention?

1                      2                      3                      4                      5  
Not at all                      Neutral                      Very willing  
willing

3. To what extent do you think there might have been disadvantages in the intervention?

1                      2                      3                      4                      5  
None likely                      Neutral                      Many likely

4. How much time was needed each day for you to carry out the contingency mapping intervention?

1                      2                      3                      4                      5  
Little time                      Neutral                      Much time

5. How confident were you that the contingency mapping procedures would be effective for your child?

1                      2                      3                      4                      5  
Not at all                      Neutral                      Very confident  
confident



**Appendix B (Continued)**

6. Did you feel that contingency mapping would decrease your child’s problem behaviors?

|          |   |         |   |             |
|----------|---|---------|---|-------------|
| 1        | 2 | 3       | 4 | 5           |
| Unlikely |   | Neutral |   | Very likely |

7. How difficult was it to carry out the intervention procedures?

|                |   |         |   |               |
|----------------|---|---------|---|---------------|
| 1              | 2 | 3       | 4 | 5             |
| Very difficult |   | Neutral |   | Not difficult |

8. How much did you like the contingency mapping intervention?

|                         |   |         |   |                     |
|-------------------------|---|---------|---|---------------------|
| 1                       | 2 | 3       | 4 | 5                   |
| Do not like them at all |   | Neutral |   | Like them very much |

9. How likely is it that you will continue to implement the procedures in the plan after intervention is terminated?

|          |   |                 |   |             |
|----------|---|-----------------|---|-------------|
| 1        | 2 | 3               | 4 | 5           |
| Unlikely |   | Somewhat Likely |   | Very Likely |

10. To what extent did you observe undesirable effects as a result of the behavior plan?

|                 |   |         |   |                       |
|-----------------|---|---------|---|-----------------------|
| 1               | 2 | 3       | 4 | 5                     |
| No side effects |   | Neutral |   | Definite side effects |

11. How willing were you to change routines in order to carry out the behavior plan?

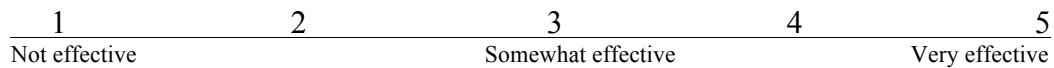
|             |   |                  |   |              |
|-------------|---|------------------|---|--------------|
| 1           | 2 | 3                | 4 | 5            |
| Not willing |   | Somewhat willing |   | Very willing |

12. How well did carrying out the plan fit into your current routines?

|            |   |          |   |           |
|------------|---|----------|---|-----------|
| 1          | 2 | 3        | 4 | 5         |
| Not at all |   | Somewhat |   | Very well |

**Appendix B (Continued)**

13. How effective was the intervention in terms of teaching social communication skills?



## Appendix C

### Fidelity Checklist-Verbal Contingency

Child: \_\_\_\_\_

Date: \_\_\_\_\_

| 1. Tell child it is time to start activity                            | Yes No |
|---|--------|
| 2. Materials to work area   | Yes No |
| 3. Verbally tell child of the activity to be completed                | Yes No |
| 4. Explanation of activity and initial assistance (to ensure success) | Yes No |
| 5. Have child complete activity and monitor                           | Yes No |
| 6. Delivers praise and reinforcer if their child completes activity   | Yes No |
| 7. Does not provide reinforcement if activity is not completed        | Yes No |

## Appendix D

### Fidelity Checklist-Contingency Mapping

**Child:** \_\_\_\_\_

**Date:** \_\_\_\_\_

| 1. Tell child it is time to start activity  | Yes    No |
|---|-----------|
| 2. Have contingency map in sight of child   | Yes    No |
| 3. Verbally tell child of the activity to be completed  | Yes    No |
| 4. Verbally tell the child of appropriate behavior and consequence along with pointing to appropriate pictures on map | Yes    No |
| 5. Verbally tell the child and point to picture of problem behavior and consequence of engaging in behavior           | Yes    No |
| 6. Have child complete activity   | Yes    No |
| 7. Delivers praise and reinforcer if their child completes task   | Yes    No |
| 8. Points to contingency map consequence if child does not engage in appropriate behavior. Do not reinforce.          | Yes    No |
| 9. Restart activity once child behaves appropriately  | Yes    No |
| 10. Deliver praise and reinforcer once task is completed.   | Yes    No |
| Total Correct Steps:  |           |
| Percentage of Correct Steps:  |           |

## Appendix E

### IRB Approval Letter



RESEARCH INTEGRITY AND COMPLIANCE  
Institutional Review Boards, FWA No. 00001669  
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799  
(813) 974-5638 • FAX (813) 974-7091

4/17/2013

Diana Sanguino, M.S.  
ABA-Applied Behavior Analysis  
4202 East Fowler Ave.  
Tampa, FL 33620

RE: **Expedited Approval for Initial Review**

IRB#: Pro00011154

Title: Using Contingency Mapping to Decrease Problem Behaviors and Increase Social Communication Skills in Young Children with Autism

**Study Approval Period: 4/17/2013 to 4/17/2014**

Dear Ms. Sanguino:

On 4/17/2013, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

**Approved Items:**

**Protocol Document:**

[Proposal\\_V1\\_3/20/13](#)

**Consent/Assent Documents\*:**

[Child Assent Form Version 1 03/20/13.pdf](#)

[Parental Consent Form Version 1 03/20/13.pdf](#)

[Therapist Consent Form Version 1 03/20/13.pdf](#)

**Assent Script:**

[Verbal Assent Version 1 3/20/13](#)

\*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

This study involves children; approved under 45CFR46.404: Research not involving greater than minimal risk. It was the determination of the IRB that your study qualified for expedited review

## Appendix E (Continued)

which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review categories:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,



Kristen Salomon, Ph.D., Vice Chairperson  
USF Institutional Review Board