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Component Analysis of the Cool vs. Not Cool Procedure

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Abstract

One of the characteristics of individuals with Autism Spectrum Disorder is the inability to develop the social skills needed to develop meaningful relationships. Several behavior programs have been developed to effectively teach a variety of necessary social skills. One of these programs has been proven to be effective with children with autism is the cool versus not cool procedure. There is a growing body of research that has demonstrated its effectiveness to helping teach appropriate social behaviors to individuals in this population (Au et al., 2016; Leaf et al., 2012; Leaf et al., 2015; Leaf, Leaf et al., 2016). However, there are no studies that evaluate if all of the components of this procedure are necessary to create a behavior change. This researcher conducted a component analysis to determine if teaching the correct behavior only versus teaching both the correct and incorrect behavior was effective in teaching social skills.

Table of Contents

Chapter 1: Introduction and Literature Review

Children diagnosed with Autism Spectrum Disorder (ASD) are characterized by persistent deficits in social communication and interactions, restricted or repetitive patterns of behavior, and significant impairments in daily functioning (American Psychiatric Association, 2013). Deficits in social skills is not the only criteria necessary to receive a diagnosis of autism, but it can be one of the most debilitating. This impairment can range from a complete lack of interest in others to the inability to engage in appropriate social interactions with others (Bauminger & Kasari, 2000). This inability to engage in appropriate social interactions can have devastating consequences including failure in school, inability to develop meaningful friendships (Bauminger & Kasari, 2000; Leaf, Dotson, Oppeneheim, Sheldon, & Sherman, 2010;), and even depression (Stewart, Barnard, Pearson, Hasan, & O'Brien, 2006). Improving the quality of life for children affected by autism has spurred important research in improving the remediation and intervention outcome in the critical area of social skills.

Researchers have analyzed and implemented various behavior interventions to improve the social skills of individuals diagnosed with an autism spectrum disorder (ASD). These interventions include video modeling (Charlop & Milstein, 1989; Paterson & Arco, 2007; Rudy, Betz, Malone, Henry & Chong, 2014), social stories (e.g., Theimann & Goldstein, 2001), behavioral skills training (e.g., Stewart, Carr, & LeBlanc, 2007), script fading (Krantz & McClannahan, 1998; Lee & Sturmey, 2014), and the teaching interaction procedure (Leaf et al., 2010). A critical component of several of the interventions mentioned above is the teacher demonstrating appropriate social behavior for the learner or the learner role-playing the appropriate behavior for the teacher. For example, in two of the six steps of the teaching interaction procedure, the teacher demonstrates the desired behavior and, in turn, the learner is provided the opportunity to practice the appropriate behavior (Taubman, Leaf, & McEachin, 2011).

One behavioral intervention that has been clinically implemented with hundreds of individuals diagnosed with ASD (Leaf et al., 2010) is the cool versus not cool procedure (CNC) (Leaf et al., 2012). Although relatively new, there is growing empirical support for the cool versus not cool procedure (Leaf et al., 2012; Leaf et al., 2015; Leaf, Leaf et al., 2016; Leaf, Mitchell et al., 2016; Leaf, Taubman et al., 2016; Au et al., 2016). The cool versus not cool procedure is a discrimination program where students have to discriminate whether the behavior being demonstrated is cool (socially appropriate) or not cool (socially inappropriate). In general, there are five components in the cool versus not cool procedure. First, the teacher demonstrates social behavior that either coincides with the cool (appropriate) or not cool (inappropriate) way of behaving. Second, the student is asked to discriminate if the demonstrated behavior was cool or not cool. Third, the teacher will provide reinforcement, usually in the form of general social praise (e.g., “Good job,” “That’s it!”) for correct discriminations or corrective feedback for incorrect discriminations. Fourth, the teacher will ask the student to state why they think the behavior was cool or not cool. Fifth, the teacher will provide either reinforcement or corrective feedback based on the student’s correct or incorrect explanations of why they think the behavior was cool or not cool. The last step involves having the student transition from discrimination to role-playing various scenarios that are related to the social skill.

The first empirical study was conducted by Leaf et al. (2012). The authors used a multiple baseline design across varying social skills including interrupting others appropriately, changing the game if the other looked bored, making appropriate greetings, changing the conversation, saying no to strangers, and making appropriate eye contact. Initially, the authors implemented CNC without the role-play and found that the participants were able to reach mastery criterion on 50% of a total of 8 skills. Leaf et al. (2012) then added the role-play component and participants were able to reach mastery for an additional 38% of skills. Overall, the results showed that CNC was highly effective in helping participants reach mastery criteria for a high percentage of skills.

Since the first CNC study conducted by Leaf et al. (2012), additional studies have been completed that replicate and expand on the original CNC study. In subsequent CNC studies, researchers have included role-play as a mandatory component of treatment and were able to show the effectiveness of the procedure. Leaf et al. (2015) expanded on the first study of the CNC procedure by adding role-play, using different participants diagnosed with autism, and by teaching a new set of social behaviors using a social skills taxonomy (Taubman et al., 2011). In their book, *Crafting Connections,* Taubman et al. (2011) described a social taxonomy that would offer a framework to help professionals and parents identify what social skills should be selected and developed. The social taxonomy consists of five domains: (a) social awareness, (b) social interaction, (c) social learning, (d) social relatedness, and (e) social communication. The main purpose of this taxonomy is to help parents, clinicians, and researchers better select social behaviors as opposed to arbitrary selection (Taubman et al., 2011). Using the social interaction domain of the social skills taxonomy (Taubman et al., 2011), three participants were each taught a skill including how to compromise when playing games with a peer, sharing a snack with a peer, and being assertive when a peer takes a play item without asking. They used a multiple baseline design across behaviors to evaluate effectiveness and resulted in teaching all of the participants to appropriately respond during naturalistic probes. All three participants displayed 0% of the steps during probes and after the CNC procedure plus role-play, all three reached mastery criterion which was set as the participant displaying 100% of the skill steps across three consecutive naturalistic probes.

Leaf, Leaf, et al. (2016) also used the CNC procedure plus role-play by referring to the social taxonomy by Taubman et al. (2011). Expanding upon the Leaf et al., (2015) study, which targeted social interaction skills, Leaf, Taubman, et al. (2016) selected a social communication skill for three participants with ASD. Taubman et al. (2011) described social communication as verbal and non-verbal expression with the intent of a reciprocal interaction with another person. The researchers, parents, and clinical supervisors for the participants selected specific social communication skills using the social skills taxonomy as a guide. It should be noted that parents filled out a questionnaire that showed their child to have deficits in social communicative behaviors. Using a multiple baseline across participants design, re-searchers were able to demonstrate the effective-ness of CNC with role-play by providing data on participant responding during role-plays. The results showed that all three participants increased their social communication skills when the CNC procedure was implemented.

The CNC procedure has also demonstrated to be more effective than other widely used interventions that aim to improve the social skills of individuals with ASD. For example, CNC has been shown to accelerate the acquisition and improvement of social skills compared to social stories. Leaf, Leaf, et al. (2016) compared the CNC procedure to social stories for teaching various social behaviors to one individual diagnosed with ASD. In this study, the researchers randomly assigned three social skill targets to the CNC procedure and three different social skill targets to the social stories procedure. By using an adapted alternating treatment design, the results showed that the participant acquired all three social skills when the CNC procedure was implemented and minimal improvements for skills taught using social stories.

The CNC procedure has also been an effective social discrimination strategy for small group teaching. Au et al. (2016) used the CNC procedure to teach individuals with autism in a group teaching format. The researchers demonstrated its effectiveness by teaching them to initiate game play with a peer, make a verbal statement to express a desire to play with the other peer, and to appropriately gain a peer's attention. This study used a multiple-probe design across the three social skills to study the impact of the CNC. Skill acquisition was measured by the participants displaying the target behaviors during baseline, intervention, intervention plus role-playing and feedback during naturalistic probes, and maintenance. The results across all of the participants showed 67% of skill acquisition during the CNC procedure alone; they were able to reach mastery criterion for an additional 33% of skills when feedback or role-playing was implemented during the naturalistic probes (Au et al., 2016). Leaf, Leaf, et al. (2016) confirmed the utility of the CNC with the role-play component when a study was conducted to teach three structured indoor games in a social skills group comprised of eight participants independently diagnosed with ASD. The researchers used a multiple baseline design across the three games replicated across all eight participants, with results showing that seven of the eight participants mastered all three social games.

There has been a recent rise in the number of empirical studies demonstrating the effectiveness of the CNC procedure as a discrimination program to teach generalized social skills for children with autism. To date, there have been six empirical studies that have documented a functional relationship between the use of the CNC procedure and an increase in an individual's ability to display appropriate social behaviors. The cumulative results of these studies suggest that the CNC procedure may be an effective way to teach social skills to individuals with autism for several reasons. First, this procedure demonstrates both socially appropriate ("cool) and inappropriate ("not cool") behaviors to learners. Second, the learner is given the opportunity to practice in role-plays with the instructor. Finally, a characteristic of the CNC procedure is that there is flexibility for the instructor to use multiple exemplars, train to "generalize, and train loosely which are contributing factors to promoting generalization as described by Stokes and Baer (1977).

When the CNC procedure is compared to other behavior interventions used to increase social behavior, (e.g., behavioral skills training, video modeling, teaching interaction procedure, discrete trial teaching) there are common components. Besides teacher demonstration of the appropriate behavior, there is also participant role-plays as seen in behavioral skills training (Stewart et al., 2007). The teaching interaction procedure also shares common components with CNC in that participants are asked to model appropriate and inappropriate behaviors (Leaf et al., 2010)

Although there are similarities between the CNC procedure and other behavioral interventions, as described above, there are clear differences. For instance, the CNC procedure varies from behavioral skills training and the teaching interaction procedure in that it does not provide a description or rationale of the target behaviors (Leaf et al., 2010; Stewart et al., 2007).

Additionally, social stories and video modeling only demonstrate appropriate behavior (Apple, Billingsley, & Schwartz, 2005, Gray & Garand, 1992).

Given that one of the major differences between the CNC procedure and other behavioral interventions is the demonstration of both the appropriate and inappropriate behavior of a social skill, the purpose of this research was to conduct an analysis of the demonstration component of the CNC procedure. Specifically, the researcher compared the effects when a participant was presented with correct demonstrations ("cool") only versus correct and incorrect demonstrations ("cool" and "not cool") when teaching a social skill to children with ASD.

Chapter II: Methodology

Participants and Setting

Randall was a 10-year-old boy diagnosed with ASD. He had intermediate conversational skills (e.g., spoke in full sentences, used spontaneous language, demonstrated a wide range of vocabulary, used accurate grammar and syntax, could engage in reciprocal conversation commensurate with his peers with consistent prompts) and displayed intermediate play skills (e.g., imaginative play, parallel play, cooperative play). Randall demonstrated a moderate level of stereotypic behavior, including mild arm flapping and perseveration on special interest topics and games. Randall had not received any services from AP when this research was being conducted.

Brandon was an 8-year-old boy diagnosed with ASD. He had intermediate conversational skills (e.g., spoke in full sentences, used spontaneous language, demonstrated a wide range of vocabulary, used accurate grammar and syntax, could engage in reciprocal conversation commensurate with his peers with consistent prompts) and displayed intermediate play skills (e.g., imaginative play, parallel play, cooperative play). Brandon demonstrated a variety of stereotypic behavior, including perseveration on topics of special interest and making repetitive statements. Prior to the study, Brandon had not received any intensive early behavioral intervention

Nate was a 10-year-old boy diagnosed with ASD. He had intermediate conversational skills (e.g., spoke in full sentences, used spontaneous language, demonstrated a wide range of vocabulary, used accurate grammar and syntax, could engage in reciprocal conversation commensurate with his peers with consistent prompts) and displayed intermediate play skills (e.g., imaginative play, parallel play, cooperative play). Nate displayed deficits in social interactions including reduced shared interest with peers and difficulty in maintaining and creating friendships. Nate received approximately two years of AP services at the time this research was conducted.

The majority of research sessions took place in a clinic room as part of a private agency that provides behavioral intervention services to individuals diagnosed with ASD. The room contained one table and two chairs. A portion of Nate's session were conducted in a private room of a community center. This room contained a table, two chairs, and office supplies. Participants participated in research from three to five days a week. Each session lasted approximately 30 minutes, including probes and teaching.

Target Skills, Dependent Variables, and Mastery Criterion

The researchers identified areas of social deficits through direct observation of the participant in his natural environment and by discussing with the participant's clinical supervisor what social skills needed to be taught. In addition, the target skills were identified by asking the parents what skills would be beneficial for their child. There were four social skill targets selected for each of the three participants that were randomly assigned to the two teaching conditions. Skills were taught in pairs with one pair of skills taught using the cool versus not cool procedure (CNC) and the other pair under the cool only procedure (CO). A third skill was selected and assigned to the control condition to assess the effectiveness of the intervention and potentially demonstrate functional control. Each skill was randomly assigned to the CNC, CO, and control conditions. Each social skill was task analyzed into smaller behavioral steps. Table

1 (see Appendix) provides information for each of the social skills taught to the three participants.

The primary dependent variable was each participant's accuracy of engaging in the steps of the social skill target in both the CNC and CO conditions. Naturalistic probes were set up, so each participant had the opportunity to demonstrate the target behavior. During these probes, the researcher set the occasion for the participant to display the target behavior. There was no prompting, reinforcement, or corrective feedback provided by the researcher. The naturalistic probes were used across all conditions and were used to determine mastery of the target skill. To meet this mastery criteria, each participant had to correctly engage in 100% of the steps of the target skill across three consecutive sessions. If a participant reached the mastery criterion for one condition but did not reach mastery criterion on the skill assigned in the other condition, the researcher implemented up to six additional teaching sessions to provide an opportunity for the participant to reach mastery criterion in that condition.

The second dependent variable was the overall percentage of correct trials in which the participant discriminated whether a demonstration was cool versus not cool in the CNC condition, the percentage of correct answers as to why the demonstration was cool versus not cool during teaching, the teaching time across both conditions, and the percentage of correct role-play opportunities.

General Procedure

The study consisted of three conditions (baseline, intervention, and maintenance). The researchers implemented sessions three to five days a week with each session lasting approximately 30 minutes in length.

Baseline and Naturalistic Probes

These conditions consisted of the researcher conducting naturalistic probes for skills assigned to the CNC condition and skills assigned to the CO conditions. In the baseline condition, the order of the naturalistic probes was randomly determined before the session began. Throughout all naturalistic probes, participants received no feedback, prompts, or reinforcement and when all probes were completed, participants would resume their regular activity.

Control

A social skill was assigned to the control condition. Naturalistic probes were conducted on the control skill during all phases including baseline, intervention, and maintenance. No teaching was ever implemented on the social skill assigned to the control set.

Intervention

Once baseline measures for the target skill were stable, intervention began with the CO and CNC conditions. The order of the teaching conditions was randomly determined ahead of time.

Maintenance

Once a participant researched mastery criterion for a given social skill during the intervention phase, the researcher placed the skill on a break for 16 days. After the break, the skill was probed for maintenance and the researcher conducted three consecutive naturalistic probes across three days to determine the skill level. Once naturalistic probes were completed for the given skill in maintenance, the skill did not receive any further intervention.

Cool or Not Cool Procedure

The researcher began sessions for the CNC procedure by labeling the skill that was going to be practiced (e.g., “We are going to practice knowing how to change the game when someone is bored”). Next, the researcher demonstrated the behavior the cool way and not cool way for four times while the participant observed (i.e., two cool and two not cool), the order of which was randomized and determined ahead of time. During the cool demonstrations, the researcher displayed all of the steps of the targeted social skill. During the not cool demonstrations, the researcher either omitted one of the steps or displayed one of the steps incorrectly. After each demonstration, the participant was provided an opportunity to verbally state if the demonstration was cool or not cool followed by why it was cool or not cool. The researcher provided general praise (e.g., good, you’re right, nice) for correct responses and descriptive feedback for incorrect responding (e.g., “Nope, it was not cool because I did not ask what you wanted to do”).

After all four demonstrations were completed, the each participant had the opportunity to role-play the targeted social behavior. The role-play was set up to be similar to the naturalistic probes except that in role-plays, the researcher was able to provide feedback. Each participant role-played the target skill until 100% of the steps were displayed correctly. If the participant role-played the target skill correctly the researcher provided specific praise (e.g., “Good, I loved how you asked me what I wanted to play.”). If the researcher did not role play the target skill correctly, the researcher provided specific corrective feedback (e.g., “That wasn’t it, you didn’t ask me what I wanted to play.”).

Cool Only Procedure

The CO procedure was the same as the CNC procedure except that the researcher demonstrated the target behavior the cool way only for four times while the participant observed. After each demonstration, the researcher provided an opportunity for the participant to state if the demonstration was cool or not cool. Again, the researcher provided general praise for correct responses and descriptive feedback for incorrect responses (e.g., “No, it was actually cool because I asked you what you wanted to play.”).

Interobserver Agreement and Treatment Fidelity

Naturalistic probes were conducted for each target skill across all conditions and sessions. A second independent observer approximately 33% of all naturalistic probes. Inter-observer (IOA) was calculated by dividing the number of agreements divided by the number of agreements plus disagreements and multiplying by 100. The IOA was 90%.

To assess treatment fidelity, an independent observer recorded planned researcher behavior for approximately 33% of all teaching sessions. Treatment fidelity was calculated by dividing the number of sessions in demonstrated all of the behaviors correctly by the number of sessions. Total treatment fidelity was 100%

Experimental Design

To compare the effects of the CNC to the CO procedure, the researcher used an adapted treatment design replicated across two sets of skills for all three participants with a staggered baseline for each set. This was done to ensure improvements in behavior could not be attributed to any extraneous variables besides the intervention for the separate sets of social skill targets for the CNC and CO procedures. This design allowed the researcher to have equivalent teaching sets of social skills in order to compare the two procedures. The researcher was able to analyze individual behavior of the participants and compare the effects of the CNC and CO by comparing the differential rates of acquisition. The design consisted of three conditions for each procedure: baseline, intervention, and maintenance. Within this design, intervention was not implemented on either procedure until there was stable responding in baseline levels.

Chapter III: Results

Participants were taught a total of 12 social skills with either the CNC or CO procedure (see Appendix, Table 1). Six social skills were taught using the CNC procedure and six were taught using the CO procedure. An additional six skills were assigned to the control condition. There were low and stable percentages of correct responding during the baseline conditions for skills assigned to the CNC, CO, and control conditions. For all three participants, mastery criterion (i.e., 100% correct during three consecutive naturalistic probe sessions) was reached for 83% of the skills taught using the CNC procedure and 83% for the CO procedure. Two skills never reached mastery criterion, one in the CNC condition and one in the CO condition.

For the six social skills taught using the CNC procedure, the average number of sessions to reach mastery criterion was 9.8 naturalistic probes. For the six social skills taught using the CO procedure the average number of sessions to reach mastery criterion was 9.4 naturalistic probes. For all three participants, when naturalistic probes were conducted during maintenance, they displayed the CNC targeted skills 91% of opportunities and for the CO targeted skills 83% of opportunities.

Randall

Figure 1 (see Appendix) displays Randall's responding during all naturalistic probes for the CNC, CO, and control conditions for all four skills taught. In Set 1, the percentages of steps Randall performed correctly were low for both the CNC and CO skills. The average percentage of correct responses for the CNC skill in baseline was 27%, ranging from 17 to 33%. The average percentage for correct responses during baseline for the CO skill in Set 1 was 44%, ranging from 33 to 50%. (average, range, 0-33% for CNC, average, range, for CO). Randall reached mastery criterion (i.e., 100% of steps correct across three consecutive sessions) within six sessions for the CNC skill and nine sessions for the CO skill. During maintenance of the first set of skills, Randall's percentage of correct responses for the CNC skill was 78%, ranging from 33 to 100% across three consecutive days of probes. For the CO, he had a slightly lower percentage correct during the CO skill averaging 77%, ranging from 50 to 100% across three consecutive days of probes. Randall's responding for the control skills remained low and stable during the baseline, intervention, and maintenance phases. During baseline, the average percentage of correct responses for the control skill was 7.3%, ranging from 0 to 11%. During the intervention phase, the average percentage of correct responses was 2.4%, ranging from 0 to 11%. In maintenance, Randall's average percentage of correct responses for the control skill was 0%.

In Set 2, the average percentage of correct responses for the CNC skill during baseline was 12% , ranging from 0 to 33%. The average percentage of correct responses during baseline for the CO skill in set 2 was 30%, ranging from 0 to 55%. Randall reached mastery criteria within 12 sessions of the CNC skill, but he never reached mastery criteria for the CO skill. There were 17 sessions completed before teaching stopped. During assessment of maintenance of the skills for this second set, Randall displayed an average of 67% for correct responses, ranging from 0 to 100% for the CNC skill across three consecutive days of probes. For the CO skill, he had an average of 61% for correct responses, ranging from 33 to 83% across three consecutive days of probes. Randall's responding for the control skills remained low and stable during the baseline, intervention, and maintenance phases. During baseline, the average percentage of correct responses during the control skill was 30%, ranging from 0 to 33%. In the intervention phase, the average percentage of correct responses for the control skill was 2%, ranging from 0 to 11%. In maintenance, the average of correct responses for the control skill was 0%.

Brandon

Figure 2 (see Appendix) displays Brandon's responding during all naturalistic probes for the CNC, CO, and control conditions for all four skills taught. During baseline for Brandon's first set, the percentage of steps Brandon performed correctly for both the CNC and CO target skill remained low. The average percentage of correct responses for the CNC skill in baseline was 30%, ranging from 20 to 40%. The average percentage of correct responses during baseline for the CO skill in Set 1 was 29%. The percentage of correct responses during each session was 29%. He reached mastery within nine teaching sessions for the CNC skill and seven teaching sessions for the CO skill. During assessment of maintenance of his skills during the first set, Brandon demonstrated 100% correct responding across three consecutive days of probes for both the CNC and CO skill. His responding for the control skills remained low and stable during baseline, intervention, and maintenance phases. During baseline, the average percentage of correct responses for the control skill was 5%, ranging from 0 to 11%. In the intervention phase, the average percentage of correct responses for the control skill was 2%, ranging from 0 to 11%. In maintenance, the average of correct responses for the control skill was 0%

In baseline for Set 2, the percentage of steps Brandon performed correctly for both the CNC and CO skill remained low. The average percentage of correct responses for the CNC in baseline was 28%, ranging from 22 to 33%. The average baseline for the CO skill was 31%, ranging from 14 to 43%. Brandon never reached mastery criteria for the CNC skill. There were

12 sessions completed before CNC teaching sessions stopped. He reached mastery criteria within six teaching sessions for the CO skill. During assessment of his skills during maintenance, Brandon demonstrated 100% correct responding across three consecutive days of probes for the CNC, which again, he did not reach mastery criteria during intervention and an average of 85% correct responding, ranging from 71 to 100% for the CO skill. Brandon's responding for the control skills during baseline, intervention, and maintenance phases was low and stable for both sets. During baseline, the average percentage of correct responses for the control skill was 0%. In the intervention phase, the average percentage of correct responses for the control skill was 2%, ranging from 0 to 25%. In maintenance, the average of correct responses for the control skill 8 %, ranging from 0 to 25%.

Nate

Figure 3 (see Appendix) displays Nate's responding during all naturalistic probes for the CNC, CO, and control conditions for all four skills taught. In the baseline phase for the first set, the percentage of steps Nate performed correctly for both the CNC and CO assigned skills remained low. The average percentage of correct responses for the CNC skill was 15%, ranging from 0 to 20%. The average percentage of correct responses for the CO skill was 22%, ranging from 0 to 33%. Nate reached mastery criteria within 8 teaching sessions for the CNC skill and 4 teaching sessions for the CO skill. During assessment of maintenance of skills taught in the first set, Nate demonstrated 100% correct responding across three consecutive days of probes for both the CNC and CO skill. His responding for the control skills remained low and stable during all phases. During baseline, the average percentage of correct responses for the control skill was 0%. In the intervention phase, the average percentage of correct responses for the control skill was 12%, ranging from 0-60%. In maintenance, the average of correct responses for the control skill was 22%, ranging from 14 to 33%.

In baseline for the second set, the percentage of steps Nate performed correctly for both the CNC and CO assigned skills remained low and stable. The average percentage of correct responses for the CNC skill was 50%, with each response in every session being 50%. The average percentage of correct responses for the CO skill was 44%, ranging from 40 to 60%. Nate reached mastery criterion within fourteen sessions for the CNC skill and twenty-one sessions for the CO skill. During assessment of maintenance of skills taught in the second set, Nate demonstrated 100% correct responding across three consecutive days of probes for the CNC skill only and an average of 73% for the CO skill. Nate's responding for the control skills during baseline, intervention, and maintenance phases remained low and stable for all phases. During baseline, the average percentage of correct responses for the control skill was 10 %, ranging from 0 to 25%. In the intervention phase, the average percentage of correct responses for the control skill was 16%, ranging from 0 to 25%. In maintenance, each response was 25%

Chapter IV: Discussion

The purpose of this study was to determine which of the two procedures, CNC or CO, was effective in teaching social skills to three participants diagnosed with ASD. Out of the twelve social skills that were taught, five out of six met mastery criterion using the CNC procedure and five out of six met mastery criterion with the CO procedure. Two additional skills did not meet mastery criterion including one assigned to the CNC and one to the CO procedure (see Appendix, Table 2). Thus, the initial results showed that when comparing the two procedures, they both were equally effective in improving social behaviors for individuals diagnosed with ASD. However, during assessment of maintenance for all three participants, the results show that the CNC procedure produced slightly higher results compared to the CO procedure. In the first skills of skills, when comparing all six skills taught across all participants, four skills were shown to have been maintained at 100% for both the CNC and CO procedure. And only for one participant (Randall) was the skill taught under the CNC correctly performed slightly higher compared to the CO skill. However, in the second set of skills, when comparing all six skills, skills taught under the CNC procedure produced higher maintenance percentages across all three participants compared to the CO procedure (see Appendix, Table 3). Another important distinction between the two procedures is that the CNC required less teaching sessions than the CO for all three participants to meet the mastery criterion. On average, the participants reached mastery criterion in 7.8 sessions under the CNC procedure and 11.4 under the CO procedure.

The results have several practical implications for those professionals who work with individuals diagnosed with ASD. First, this study potentially adds further support for the effectiveness of the cool versus not cool procedure. Although, there has been other studies evaluating the effectiveness of the CNC (e.g., Au et al., 2016; Leaf et al., 2012, Leaf et al., 2015; Leaf, Leaf et al., 2016); there has not been a study that has conducted a component analysis to evaluate if the participant requires an opportunity to observe both the correct and incorrect demonstration of the target social skill or just the cool demonstration to actually learn the social skill.

Second, since the results of implementing the CNC and CO procedure were similar in efficiency and effectiveness, this opens up the possibility for practitioners to consider whether the CNC or CO is appropriate in teaching specific social skills. Practitioners may need to consider the nature of the skill. Some social skills may only require a social discrimination such as “Is this person bored or not bored?”, while more complex or interactional skills may require an individual to be taught both the correct and incorrect responses. For example, when negotiating what to play with a friend, an individual may need to state what they want to play, figure out what a friend wants to play, then negotiate which one they should play first. In this study, one participant was taught the skill of negotiating play using the CNC procedure and another participant was taught this same skill using the CO procedure. For this particular skill, a participant was able to reach mastery criteria in less sessions with the CNC procedure (14) than the CO procedure (17). Conversely, when two different participants were taught changing a game when someone is bored, which required the participants to rely on making a discrimination between bored or not, the CO procedure was effective in teaching this skill in less sessions than the CNC procedure. However, it is difficult to determine if this distinction alone, whether or not a skill relies on discrimination or is more complex and interactional, is the main factor in teaching a new social skill.

Third, the CNC and CO were effective in teaching practical social skills that individuals with or without ASD will encounter in their everyday lives. The types of socials skills taught here were multi-step social interaction skills that required multiple responses and not just presented with an occasion to respond.

This study did not go without its limitations that will need to be addressed in future studies. First, the results on whether or not CNC or CO procedure is most effective was not entirely conclusive. Since the number of skills that met mastery criterion were evenly split between the two procedures, the researcher had intended on adding a third set of skills to Nate. However, Nate was no longer able to participate in the study due to him moving schools and thus affecting his schedule and availability. Adding an extra set could have yielded more conclusive results in comparing the effectiveness of the CNC versus CO procedure. A future study can determine when a practitioner would use the CNC or the CO and the parameters of each procedure’s effectiveness.

A second limitation is that there was some variability in the number of sessions that continued when one skill met mastery criterion. In other words, if a skill taught using the CNC or CO procedure met mastery criteria, the number of teaching sessions that continued for the other non-mastered skill was variable ranging from five to six sessions.

A third limitation is the time it took for the participants to reach mastery criterion. Across the 10 social skills it took participants a range of four to 21 sessions. A future study may wish to assess the factors that influence the variability in number of sessions. This study did not consider the participant's preference for one procedure over another. A future study may consider including the student's preference for a procedure and evaluate if including this factor would accelerate skill acquisition.

A fourth limitation is a lack of generalization measures in more natural environments (e.g., school or home setting for all participants. Nate was the one participant where naturalistic probes and teaching sessions were conducted in a variety of settings including the autism clinic, after-school day care, and his home. Thus, it remains unknown if Randall and Brandon would have generalized the skills to more natural environments. Additionally, maintenance was probed after 16 days. Future research should consider the effectiveness of the procedures after a longer period and in various environment. Despite these limitations, the results showed that relevant and complex social skills can be taught three individuals diagnosed with ASD, providing clinicians with additional behavioral approaches and procedures in teaching socials skills to other children diagnosed with ASD.

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Appendix

Table 1

Targeted Skills

Participant	*Set*	*Skill Taught*	*Taught With*	*Step 1*	*Step 2*	*Step 3*	*Step 4*	*Step 5*
Randall	1	Changing the game when someone is bored	CNC	Asking fi the person wants to play something else	Saying okay	Asking the person what he wants to play	Getting the game	Playing the game
Randall	1	Continue the conversation	CO	Respond to question with an on-topic statement	Ask a related question	Refrain from interrupting	Make a related statement	--------
Randall	2	Inviting a third person	CNS	Approach the third person	Ask if they want to play	Wait for their response	Play with the third person	--------
Randall	2	Play negotiation	CO	State what they want to play	State why	Ask person what they want to play	Offer to play peer's choice first and then their choice	--------
Brandon	1	Empathy	CNC	Face the person	Ask if they are okay	Make an empathetic statement	Asking if they can do anything to help	--------
Brandon	1	Changing the conversation when someone is bored	CO	Change the topic	Engage in new topic	Wait for person to respond	Make a related comment	Wait for person to respond
Brandon	2	Acknowledge presence	CNC	Face the person	Make a general greeting	Eye contact and wait for response	Ask general inquiry	Eye contact and wait for response
Bandon	2	Explain prior event	CO	Face the person	Make a statement to elicit response	Describe event	Answer conference question	--------
Nate	1	Initiating conversation	CNC	Face the person	Make initial statement or ask question	Wait for response w/o interrupting	Make a related statement	--------
Nate	1	Changing the game when someone is bored	CO	Asking if the person wants to play something else	Saying okay	Asking the person what he wants to play	Getting the game	Playing the game
Nate	2	Play negotiation	CNC	State what they want to play	State why	Ask person what they want to play	Offer to play peer's choice first and then their choice	--------
Nate	2	Receiving a compliment	CO	Face the person	Say thanks	Make a comment about compliment	Re-engage in conversation	--------

Table 2

Number of Sessions to Mastery Criterion

Participant	CNC	CO
Randall	Set 1- Changing Game 6	Continue Conversation 9
	Set 2- Invite 3rd Person 12	*Play Negotiation 17
Brandon	Set 1- Empathy 9	Change Conversation 7
	*Set 2- Acknowledge Presence 12	Explaining Prior Event 6
Nate	Set 1- Initiating Conversation 8	Changing Game 4
	Set 2- Play Negotiation 14	Compliments 21

*Social skill not mastered

Table 3

Summary of Percentage Correct (Mean and Range) during Maintenance for CNC, CO, and Control Conditions

Participant	CNC	CO	Control
Randall	Set 1 78% (33 to 100%) Set 2 67% (0 to 100%)	78% (50 to 100%) *61% (33 to 83%)	0% 28%
Brandon	Set 1 100% *Set 2 100%	100% 85% (71 to 100%)	0% 8% (0 to 25%)
Nate	Set 1 100% Set 2 100%	100% 73% (40 to 100%)	22% (14 to 33%) 25%

*Social skill not mastered

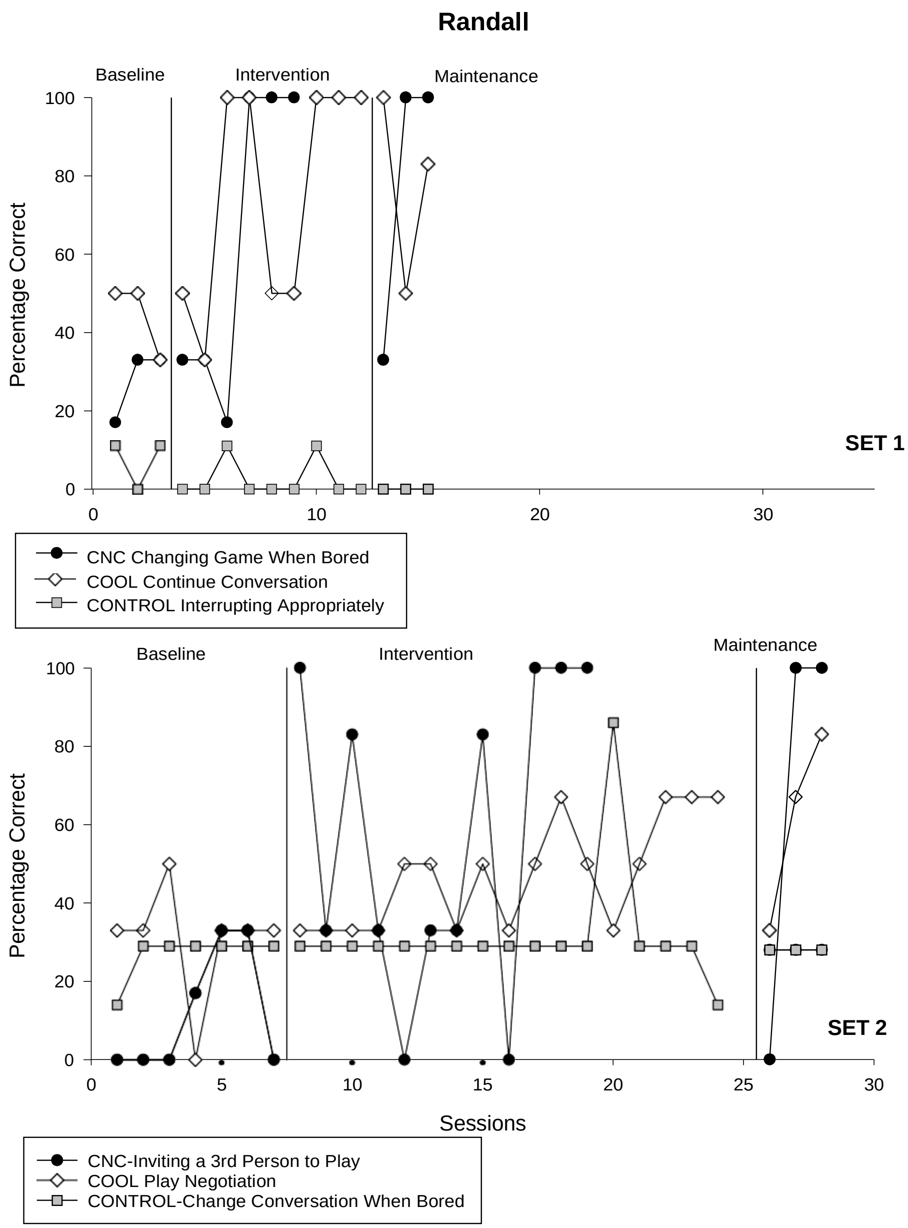

Figure 1. Percentages of Randall's Independent Correct Responses Across Each Condition for Two Sets.

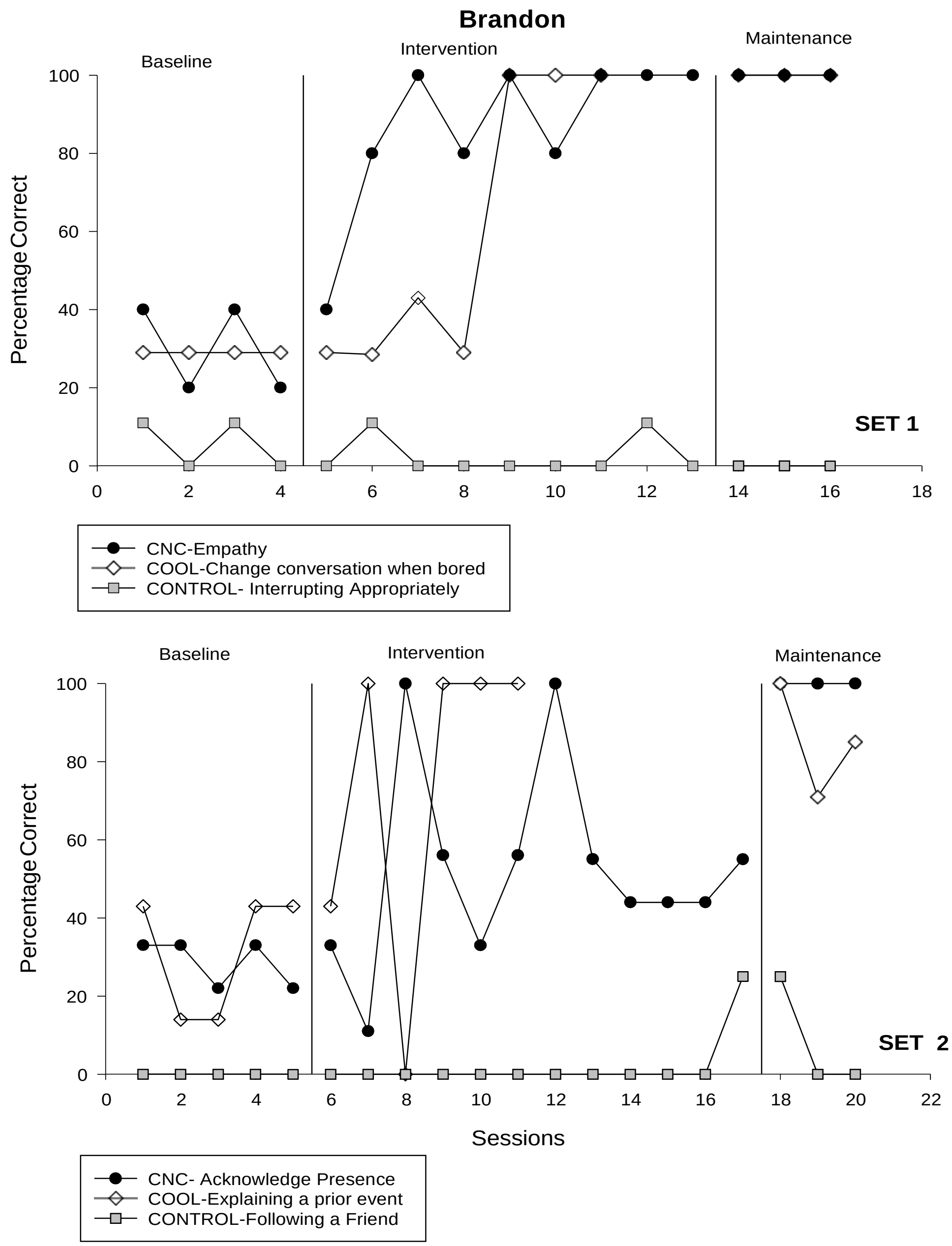

Figure 2. Percentages of Brandon's Independent Correct Responses Across Each Condition for Two Sets.

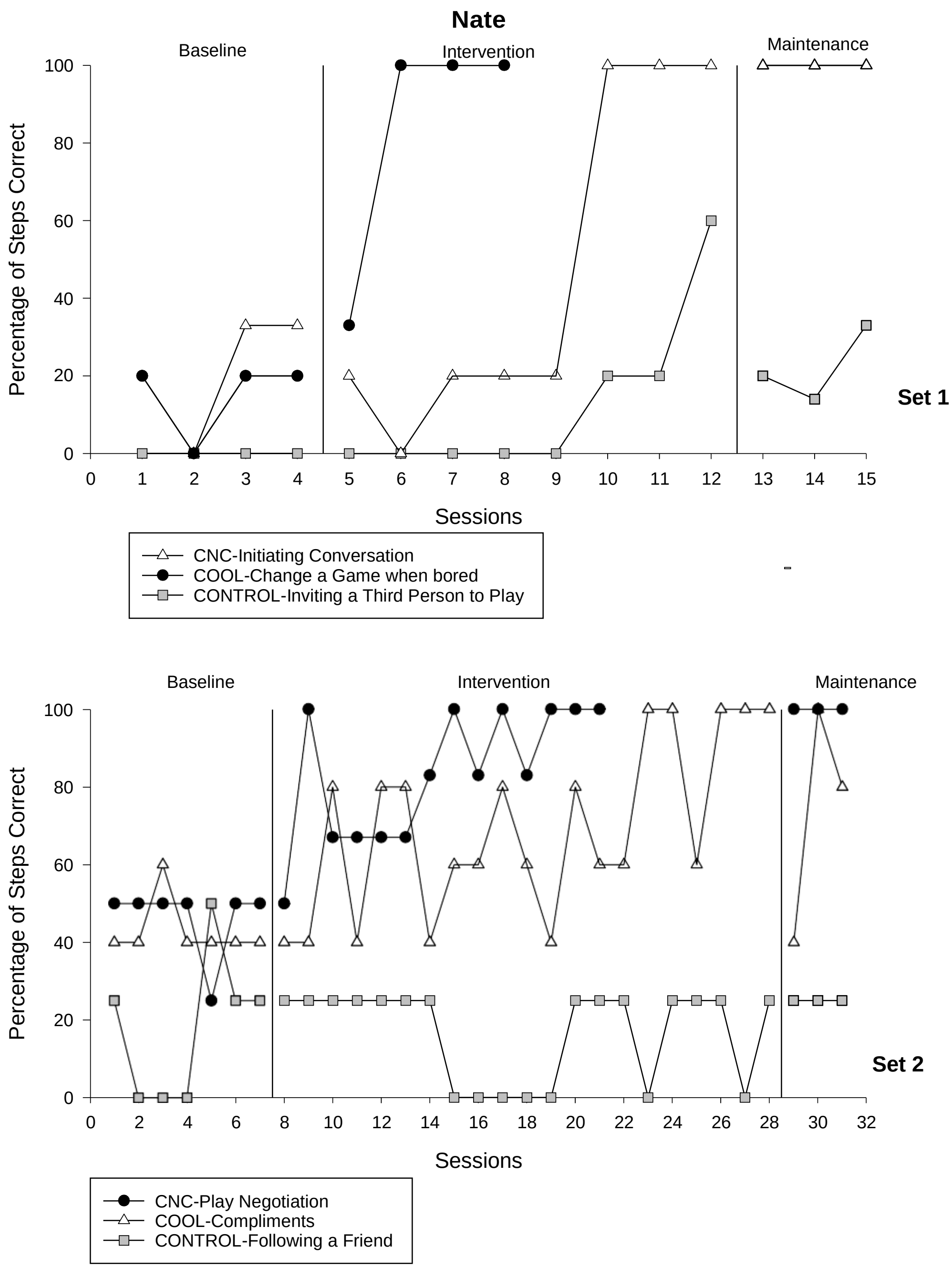

Figure 3. Percentages of Nate's Independent Correct Responses Across Each Condition for Two Sets.