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# Teaching Children with Autism to Look and Smile While Having a Photo Taken

Ivy M. La Rue
*St. Cloud State University*, ivylarue@gmail.com

# Teaching Children with Autism to Look and Smile While Having a Photo Taken

by

Ivy M. La Rue

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Michele R. Traub, Chairperson
Benjamin N. Witts
Kimberly A. Schulze

## Abstract

Orientation and social skill delays common within Autism Spectrum Disorder (ASD) may prevent a child who has a diagnosis of ASD from learning to respond appropriately in photos. In research on teaching joint attention skills, children with autism have been successfully taught to respond appropriately to other types of social stimuli. The purpose of this study was to use teaching strategies from joint attention research to teach three children diagnosed with autism to look and smile in photos. All three children learned to simultaneously look and smile in photos and continued to engage in the response when the reinforcement schedule was thinned. Interest in participating in photos also appeared to be an additional result as all three participants began to regularly mand for participation in photos.

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# Chapter I: Introduction and Literature Review

Photographs are a common part of modern society, and many people commonly use photos to document everything from regular daily occurrences to memorable achievements. A brand analysis conducted by Simply Measured found that in 2014, 60 million photos were uploaded to Instagram™ each day. Similarly, an analysis of internet trends by Meeker (2016) found that over 3 billion photos were shared across five popular social media platforms (Instagram™, Facebook Messenger™, Snapchat™, Facebook™, and Whatsapp™) in 2015. While many of the photos shared online may not be portraits, taking photographs of people remains a common practice. Life milestones or celebrations, such as the first day of school or birthdays are often documented with photos. School children have their portraits and class pictures taken each year. Similarly, many forms of government-issued identification, such as a passport, also requires a photographed portrait.

Many parents enjoy documenting their child's life with pictures as they grow and achieve milestones. When parents take pictures of their children, they will hold up the camera and give an instruction, like "look" or "1, 2, 3." They may also use various inducements to get the child to look or smile, such as shaking a preferred toy or making a funny face. When the child looks and smiles at the camera, that behavior is likely to contact reinforcement. Initially, possible reinforcers could be praise from the photographer or being shown a picture of themselves after the photo is taken, assuming a digital camera was used. As the child grows older, it is likely that these behaviors will be maintained by other consequences, such as producing a photo that meets the expectations of others.

If a child does not learn to look and smile at a camera, the child may stand out in a class photo. Similarly, a parent or professional photographer may have to spend more time taking a photo, in an attempt to get a picture with the child looking at the camera. In Canada, a passport photo must: (a) be taken by a commercial photographer, and (b) include an individual who is looking straight into the camera with opened eyes (Government of Canada, 2015). If a child has not learned to orient to the camera, the photographer may need to continue to take pictures until they get a successful one. As the photographer continues to attempt to take the picture, it could easily escalate into a scenario that could be stressful for the parent or child, such as an agitated photographer or a line of impatient customers. Furthermore, failing to obtain a photo that meets passport criteria will mean that an individual is not able to obtain a passport, which greatly limits a family's ability to travel outside of the country.

Crucial skills for learning to participate in photos include the ability to: a) respond to social bids for attention (e.g., name call), b) follow instructions, and c) shift orientation between objects and people. The Center for Disease Control and Infection (2016) stated that babies typically begin to respond to their names by six months. By age one, typically developing babies are also able to follow simple directions. Shifting attention between an object and a person, commonly referred to as joint attention, also typically develops by the end of a baby's first year of life (Stahl & Striano, 2005). Many of the prerequisite skills described above are key deficits in Autism Spectrum Disorder (ASD). Children diagnosed with ASD often have difficulty responding to others' social bids, sharing other people's interests, and responding appropriately during social interactions (American Psychological Association, 2013). The inability to shift attention and orient to different stimuli is well documented in research with children with ASD (e.g., Courchesne et al., 1994; Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998; Dawson et al., 2004; Landry & Bryson, 2004; Leekam & Ramsden, 2006; Maestro et al., 2002; Osterling & Dawson, 1994; Swettenham, Baron-Cohen, Charman, Cox, & Baird, 1998).

Home video analysis of babies later diagnosed with ASD shows that deficits in social behavior and orienting can be present within a baby's first year of life (Maestro et al., 2002; Osterling & Dawson, 1994). The babies in the videos were found to spend less time looking at people and orienting to social stimuli (e.g., name call, adult's gaze) than typically developing babies (Maestro et al., 2002; Osterling & Dawson, 1994). Swettenham et al. (1998) also analyzed videos of infants who were later diagnosed with ASD, and found that they spent less time than typically developing peers shifting their attention between people and from objects to people. Similarly, when these infants with ASD did shift their attention, it was generally between objects (Swettenham et al., 1998). Experimental studies also have shown that children with ASD are less likely than children with typical development or other developmental disabilities to orient towards social (e.g., humming, calling name) and non-social (e.g., phone ringing) stimuli, although the discrepancy was found to be much larger when the stimuli were social (Dawson et al., 1998; Dawson et al., 2004). Similarly, Leekam and Ramsden (2006) found that children with ASD were less likely than children with other developmental delays to attend to both vocal (e.g., "look") and non-vocal (e.g., waving) social stimuli.

The development of eye tracking technology has aided research on attention and focus in children with and without ASD. An eye tracker is a device that records eye movement and duration of time spent gazing at a stimulus. Chawarska, Macari, and Shic (2012) showed toddlers who were wearing eye tracking devices, videos of an actress looking and speaking towards the child and videos where the actress looked toward toys or looked down while making a sandwich. When the toddlers with ASD were shown the videos with toys or sandwich making, their orientation distribution was similar to typical and developmentally delayed toddlers (Chawarska et al., 2012). When shown videos with actors speaking and looking towards them, however, toddlers with ASD attended to the stimulus less than toddlers without ASD (Chawarska et al., 2012). A number of studies have also found that toddlers and children with ASD spend less time looking at faces when watching video clips of different social interactions than children without ASD (who were developmentally matched to the children with ASD; Hosozawa, Tanaka, Shimizu, Nakano, & Kitazawa, 2012; Magrelli et al., 2014; Nakano et al., 2010; Shic, Bradshaw, Klin, Scassellatti, & Chawarska, 2011; von Hofsten, Uglig, Adell, & Kochukhova). Speer, Cook, Mcmahon, and Clark (2007) compared eye gaze patterns of adolescents with ASD and developmentally matched peers (who did not have ASD) while they looked at pictures of one person, pictures of a social interaction, videos with one person speaking, and videos of a social interaction. Time spent orienting to the people's eyes was only found to be significantly different during the group video condition (Speer et al., 2007), suggesting that children with ASD had more difficulty orienting when the stimulus was more complex (i.e., a video of more than one person).

Collectively, this research demonstrates that many children with ASD are less likely to orient their attention towards the correct target when presented with social stimuli, such as being told to "look." Considering these delays, it is plausible that a child with ASD will not naturally learn to respond to a camera and an unfamiliar stimulus, such as "say cheese," by orienting towards the camera lens, smiling, and continuing to engage in these behaviors until the picture is taken. Independently acquiring this skill is further complicated by the fact that the appearance of the camera (e.g., camera, smartphone camera), the location of the lens, and the bid for attention regularly changes.

Behavior analytic research has demonstrated that children with ASD can be taught to shift their attention to socially relevant stimuli and to respond appropriately to those stimuli (Isaksen & Holth, 2009; Jones, Carr, & Feeley, 2006; Krstovska-Guerrero & Jones, 2013; Persicke et al., 2013; Taylor & Hoch, 2008; Whalen & Schreibman, 2003). Specifically, researchers have successfully taught children to respond to social stimuli with a smile (Gena, Couloura, & Kymissis, 2005; Krstovska-Guerrero & Jones, 2013). The majority of this research has focused on teaching children with ASD joint-attention skills. Children engage in joint attention when they shift their attention between an object or event and another person (Mundy, Sigman, & Kasari, 1994). Joint attention can be divided into two discrete skills: responding to joint attention (RJA), and initiating joint attention (Isaksen & Holth, 2009; Jones & Carr, 2004; Taylor & Hoch, 2008). RJA involves: a) orienting towards the correct item/scene, b) responding to the item/scene (e.g., changing facial expression), and c) looking back at the person who initiated the interaction (Taylor & Hoch, 2008). The behavior that individuals generally engage in when having their photo taken shares many similarities with the first two steps of RJA. First, the photographer initiates the interaction by holding up the camera and presenting an instruction, such as “look at me.” Following this social stimulus, the individual being photographed will orient their eyes to the camera lens and respond by briefly maintaining their gaze and smiling. Strategies used to teach children with ASD to respond to bids for joint attention, therefore, may be effective in teaching children with ASD to respond appropriately in photos.

Much of the behavior analytic literature on RJA used strategies from discrete trial training (DTT) and pivotal response training (PRT) (Isaksen & Holth, 2009; Jones, Carr, & Feeley, 2006; Krstovska-Guerrero & Jones, 2013; Whalen & Schreibman, 2003). DTT is an instructional method that is based upon the principles of applied behavior analysis (ABA) (Lerman, Valentino, & LeBlanc, 2016). Teaching using DTT includes presenting an antecedent (discriminative stimulus), delivering structured prompts, waiting for the target response, and providing consequences for engaging or not engaging in the target response (Lerman et al., 2016). During DTT, the trainer also presents many repeated teaching trials. The purpose of repeated trials is to increase the likelihood of the response contacting reinforcement in the presence of a discriminative stimulus, thus increasing the likelihood of the stimulus gaining control over the response (Lerman et al., 2016). In DTT, consequences that follow the target behavior are often contrived reinforcers, such as edible items. This may be problematic when teaching joint attention, because in typically developing children joint attention skills are likely reinforced by social consequences, such as sharing an experience (Mundy et al., 1994). Therefore, many researchers have combined DTT with other more naturalistic teaching strategies, such as PRT, which aims to increase the child's motivation during teaching by providing choice, interspersing current and mastered skills, and using naturalistic consequences (Koegel, Koegel, Harrower, & Carter, 1999). Specifically, many researchers have included natural consequences in their DTT-focused training (Isaksen & Holth, 2009; Jones et al., 2006).

In the first published behavior analytic study to teach joint attention skills, Whalen and Schreibman (2003) taught five children with autism to respond to bids for attention and to recruit an adult's attention using gaze shifts and pointing. Using teaching strategies from DTT and PRT, participants were taught to look when the adult made different bids for attention. When the child oriented to the item that the adult was looking at, the adult would allow the child to access the toy that was being manipulated/looked at. All of the children who participated in the intervention learned to orient their attention to objects that the adults presented, looked at, and/or pointed to within 16 to 26 days, and the skills generalized to other settings.

Jones et al. (2006) taught children with ASD to shift their attention using one of two different most-to-least prompting techniques (i.e., name call or sweep), depending upon the child's skill repertoire. During training, the instructor used a remote to turn on a mechanical toy, turned towards the toy, looked and pointed at the toy and then made a comment (e.g., "wow look!"). If the child correctly shifted their attention, the adult provided the child's preferred form of social attention (i.e., natural consequences), and then engaged in an activity that the child preferred (i.e., activity interspersal). All participants learned to respond correctly, and their responses generalized to novel items.

Persicke et al. (2013) taught three children with ASD to shift their attention and respond to socially relevant stimuli that were associated with particular emotions, using a treatment package consisting of rules, modeling, rehearsal, prompting, and feedback. Socially appropriate vocalizations taught included saying "what is it?" or "are you okay?" During baseline, none of the participants consistently shifted their attention to the stimulus or made an appropriate vocalization. Following training, all three participants learned to consistently shift their attention and respond to the stimulus.

Persicke et al. (2013) demonstrated that children with ASD can be taught to orient and respond appropriately to social stimuli that are associated with particular emotions. Gena et al.

(2005) extended this finding to preschool-aged children with ASD. In this study participants were taught to respond appropriately to an adult's statement (e.g., make appropriate facial expression and statement) that was intended to result in a disproving, appreciative, or sympathetic response from the child. Models, instructions, and gestures were used to teach correct responses. During baseline, participants rarely responded to an adult's statement with an appropriate response. With the onset of training, appropriate responding increased, and all children learned to engage in contextually appropriate vocal and facial responses. These behaviors generalized to other adults and to untrained stimuli, and the skill was maintained at 1- and 3-month follow ups. This study therefore demonstrated that children with ASD, can be taught to respond to social stimuli with appropriate facial expressions, like smiling.

Krstovska-Guerrero and Jones (2013) taught children with ASD to smile, then to look, and finally to shift their gaze and smile in response to a bid for joint attention. This study, which taught behavior topographically similar to that required for taking a photograph, utilized most-to-least prompting to teach each component skill (i.e., smiling and looking) by itself before chaining them together in the final training phase. All three participants acquired the terminal response in less than 30 sessions, and maintained it on an intermittent reinforcement schedule. These results strongly suggest that children with ASD can be taught to orient to and smile at a camera when prompted.

In summary, many children with ASD have difficulty orienting their attention to complex social stimuli. Participating in photos requires a number of social behaviors, such as responding to unfamiliar bids for attention (e.g., "say cheese") with a very specific set of responses (i.e., looking and smiling at a camera). However, no study to date has taught children with ASD to respond appropriately in pictures. Appropriate picture-taking behaviors share many similarities to the initial two steps in RJA. For this reason, behavior techniques used to teach RJA skills may be successful in also teaching children with ASD to look and smile in pictures. The purpose of the current study was to evaluate whether a DTT teaching package, similar to the one used by Krstovska-Guerrero and Jones (2013) but with naturalistic consequences, could be used to teach children with ASD to look and smile in pictures. Additional aims of this study were to determine if caregivers observed significant change in photos and if the trained behavior generalized to settings where novel instructions were used.

# Chapter II: Methods

## Participants, Setting, and Materials

**Participants.** Participants were recruited from an ABA treatment center for children with developmental disabilities in Ontario, Canada. A participant recruitment flyer was emailed to parents by the center's executive director and posted in the treatment center lobby for two weeks. Parents who were interested in learning more about the study were instructed to contact the experimenter. Fourteen families contacted the experimenter and requested that their child participate in the study. Prospective participants were required to: (a) have a diagnosis of autism (i.e., ASD, Autistic Disorder); (b) respond to their name by either ceasing an activity, looking up, or making eye contact; (c) imitate a smile; (d) remain sitting in a chair for 30 seconds; and (e) not have previous training in posing for photographs. An eligibility assessment was completed with all 14 prospective participants (Appendix A). The eligibility assessment included a direct assessment of inclusion criteria b, c, and d, and a review of records and programming history for criteria a and e. Six prospective participants did not meet one or more of the eligibility criteria and were excluded. Acquisition of the terminal response was tested with the eight remaining children to determine whether they would perform the target skill (i.e., looking and smiling at the camera) when prompted with nine different instructions. Children who looked and smiled at the camera on at least 5 out of 9 trials were excluded from the study. Five of the eight remaining children looked and smiled on five or more trials and were excluded. The remaining three participants met all the eligibility criteria and were included in the study.

Sarah was a 6-year-old girl who participated in individualized programming at the ABA center for 20 hours per week. Sarah used a high-tech Augmentative and Alternative

Communication (AAC) device to communicate. With the AAC device, Sarah communicated in two- to three-word sentences (e.g., “I eat cookies”). Vocally, Sarah was able to make many clear vocal approximations of one to two words. Most of Sarah’s scores fell within the Level 2 (18-30 months) range on the *Verbal Behavior Milestones Assessment and Placement Program* (VB-MAPP); however, Sarah did have some skills that fell within the Level 3 (30-48 months) range (i.e., visual perception and matching to sample, play, reading, writing, and math). At the time of the study, Sarah’s most recent VB-MAPP milestones score was 96 out of 170.

Philip was a 7-year-old boy who participated in individualized programming at the ABA center for 22.5 hours per week. Philip was able to communicate vocally in full sentences (e.g., “Ivy, let’s take pictures”). Philip’s total score on the *Assessment of Basic Language and Learning Skills - Revised* was 786 out of 1482. Philip also had a strong interest in technological devices (e.g., laptops, iPads), and he would often try to touch or take other peoples’ (including strangers’) devices. At the time of the study, Philip had a behavior intervention plan (BIP) that aimed to teach him to not touch other people’s technological devices. Philip was taught that he could touch a device if it had his name on it. To accommodate the BIP, Philip’s name was added to the two smartphones that were available following a correct response. Further, Philip was blocked from touching all other devices in the study (i.e., cameras used to take pictures, metronome, and laptop) and reminded that he could only play with devices that has his name on them.

Maggie was a 6-year-old girl. At the start of the study, Maggie participated in individualized programming at the ABA center for 10 hours a week. After Session 15, Maggie increased to 24 hours a week. Maggie was able to communicate vocally with close approximations of one or two words; however, Maggie often repeated the same word twice when making requests. At the time of the study, Maggie was learning to use a flip-and-talk board. Most of Maggie's scores fell within the Level 2 range on the VB-MAPP, but she did have some skills that fell within the Level 3 (30-48 months) range (i.e., listener, reading, and math). At the time of the study, Maggie's score on the VB-MAPP milestones was 83 out of 170.

**Setting.** The study was completed at a privately owned center that delivers ABA-based programming to children with ASD. The majority of sessions were conducted in a classroom used for assessments. If the regular classroom was unavailable, sessions were occasionally also conducted outside or in a small toy room. These locations were chosen because they were quieter than the regular teaching classrooms. Toys common to the center, such as blocks, musical toys, and puzzles, were present and accessible in all settings. If other individuals were present in the room, they were asked to remain silent until the session was complete. Potential distractions, such as the door bell ringing or another person entering the room, were not preventable and occasionally occurred during sessions. Each session included a participant and two adults (the prompter and the photographer). The experimenter was present during all sessions and served as the prompter in all teaching sessions. The photographer varied across sessions. Various trained staff from the center served as the photographer. Prior to each session, the experimenter used a measuring tape to determine where to place each chair (see Appendix B). The participant's and photographer's chairs faced one another and were 90 cm apart. The prompter sat between the photographer and the participant. The prompter sat approximately 50 cm from the participant's right side and 50 cm from the photographer's left side. A table was placed to the photographer's right side, and the cameras, data sheet, and laptop were all kept on the table. In Philip's sessions, the cameras were kept in a bag under the photographer's chair to prevent touching.

**Materials**. The photographer rotated between three different photo-taking devices: an iPad™, an iPhone™, and a Nikon D 3100™. A second iPhone™ and a Samsung Galaxy ™, both equipped with camera-related apps, were available following a correct response. A third iPhone™ with headphones was used as a metronome. The metronome-phone was set to 60 bpm. Every session also included the following items: three chairs, a table, a data sheet, and a writing utensil. Sessions were videotaped using a center-owned Macbook Pro™. Sessions were recorded in Quick Time Player™. During videotaping, the recording program was minimized so that the participant was not able to see the video on the screen.

**Photographer and Data Collector Training**

During each training session, the experimenter provided prompts when required. Five front-line instructors at the ABA center were trained to be the photographer and to collect session data. A sample data sheet can be found in Appendix C. A lead instructor from the center who was not involved in the implementation of the study was trained to collect secondary trial-by-trial data and to score procedural integrity.

**Photographers.** The experimenter used a Behavior Skills Training (BST) package that included instructions, modeling, rehearsing, and feedback to train the photographers (Parsons, Rollyson, & Reid, 2012). First, the experimenter reviewed the procedural integrity checklist and modeled each step on the list (see Appendices D & E). Next, the photographer rehearsed each step with the checklist present. The experimenter and another employee from the center participated in the rehearsal by acting out the roles of the prompter and the participant. If an error was made, the experimenter provided specific feedback, and the phase was rehearsed again. A videotaped rehearsal occurred after each phase had been correctly practiced with the procedural integrity checklist present. The checklist was not present during the videotaped rehearsal. After the rehearsal, the experimenter observed the videos to score the photographer's accuracy of implementation. To participate in the study, the photographers had to achieve 100% accuracy in a rehearsal of each phase of the study (i.e., generalization assessments, baseline, terminal response probes, and training). All five photographers met participation criteria after one or two rehearsals.

**Data collectors.** The five photographers and the integrity data collector were trained to collect data using the rehearsal video clips. First, the experimenter reviewed the study protocol, data sheet, and procedural integrity checklist with the trainee. Next, the trainee watched the video clips with the experimenter, and the experimenter modeled how to collect trial-by-trial data. During training for the integrity data collector, the experimenter also modeled how to score procedural integrity with the checklist. Following this, the trainees watched different video clips and independently collected trial-by-trial data. At this time, the integrity data collector trainee also filled out the procedural integrity checklist. The trainee and the experimenter then compared results for accuracy, and the experimenter provided feedback. To participate in the study, photographers had to score trial-by-trial data in each phase with 100% accuracy. The integrity data collector had to score trial-by-trial and procedure integrity data for each phase with 100% accuracy. The five photographers and integrity data collector all met participation criteria within one or two rehearsals.

**Design, Measurement, and Data Collection**

A replicated A-B design across responses with terminal response probes was used to evaluate the effects of the treatment package for three participants.

**Dependent variables.** Two dependent variables, similar to those used by Krstovska-Guerrero and Jones (2013), were measured throughout the study. *Looking at the camera* was defined as orienting ones' eyes towards the camera's lens within 3 s of the instruction. *Smiling at the camera* was defined as turning up the corners of the mouth at both sides within 3 seconds of the instruction. The participant did not need to show their teeth for a smile to be scored as correct. The participant's lips could be separated or pressed together. Looking, smiling, and simultaneously engaging in both responses were scored separately in every session and were graphed as the percentage of correct trials during each session.

The definition of a correct response varied across training phases. During single-instruction training, engaging in the single response that corresponded with the instruction (e.g., looking at the camera if the instruction was "look") was considered to be correct. During compound-instruction training, a correct response was defined as looking and smiling at the camera simultaneously. Furthermore, during training phases, a response was considered correct if it occurred following the delivery of an appropriate prompt for that level, as long as it occurred within the predetermined time frame.

The photographer collected trial-by-trial data during each session. All sessions were videotaped. Prior to graphing each set of data, the experimenter observed session videos and checked the data sheet for accuracy. The integrity data collector observed session videos and scored procedural integrity and dependent variable data.

**Procedural integrity measures.** The integrity data collector used the procedural integrity checklist to score implementation integrity. Photographer procedural integrity included the following variables: (a) correct camera and body position, (b) presentation of the correct instruction, (c) use of correct camera, (d) time management (e.g., takes picture within predetermined amount of time), (e) delivery of correct consequence/on correct schedule of reinforcement. Prompter procedural integrity included: (a) correct body position and (b) correct prompt delivery. A "yes" indicated that the photographer or prompter engaged in the correct response on each of the nine trials. A "no" indicated that the photographer or prompter did not engage in the correct response on one or more of the nine trials. Procedural integrity for each session was expressed as the total percent of correct responses for the photographer and for the prompter.

Photographer and prompter procedural integrity were scored during 96%, 97%, and 95% of sessions for Sarah, Philip, and Maggie, respectively. The average procedural integrity score for Sarah's photographers were 100% during every phase except compound-instruction training, which was 99.5%. The average procedure integrity score for Sarah's prompter was 100% during every phase of the study. Philip and Maggie's photographer and prompter's average reliability scores were 100% in every phase of the study.

**Interobserver agreement.** The dependent variable data were used to calculate point-by-point interobserver agreement (IOA). An agreement was defined as both observers recording that the correct response occurred, or both recording that an incorrect response occurred, on a particular trial. A disagreement between the observers was defined as one observer recording that the correct response occurred and the other recording that an incorrect response occurred. To calculate IOA, the total number of agreements were added together and divided by the total number of agreements plus disagreements. This total was then multiplied by 100 to determine the percentage of agreement between the two observers.  IOA was scored in 96%, 97%, and 95% of sessions for Sarah, Philip, and Maggie, respectively. The percentages of agreement for looking were 98%, 98%, and 96%, for smiling they were 98%, 97%, and 97%, and for simultaneous looking and smiling they were 98%, 98%, and 96% for Sarah, Philip, and Maggie, respectively.

The kappa statistic was also calculated to determine the amount of agreement that was due to chance (Watkins & Pacheco, 2000). The following equation is used to calculate kappa: $(P_O - P_C) \div (1 - P_C)$. The $P_O$ is calculated in the same way as described above for IOA (total agreement/total agreements + total disagreements). The $P_C$ is calculated by adding the first row and column together and dividing by the total,  adding the second row and column together and dividing by the total, and then adding the two totals together (see Appendix F). The kappa statistic is expressed as a correlation coefficient. According to Watkins and Pacheco (2000), a correlation coefficient of 0.40 or less suggests poor agreement, 0.40 to 0.60 suggests fair agreement, 0.60 to 0.75 suggests good agreement, and 0.75 or higher suggests excellent agreement. The kappa co-efficient scores for looking were 0.91, 0.88, and 0.87, for smiling they were 0.95, 0.93, and 0.88, and for simultaneous looking and smiling they were 0.97, 0.96, and 0.91 for Sarah, Philip, and Maggie, respectively.

**Photo and video storage.** The cameras used in the study to take photos were kept at the treatment center for the whole duration of the study. When the cameras were not in use, they were kept in a locked location at the center. SIM cards were removed from cameras that were capable of connecting to the internet (i.e., tablet, smartphone), and these cameras were also disconnected from WI-FI. At the end of each session, video footage and photographs were removed from the cameras and computer and saved to a password-protected external hard drive. The external hard drive was also kept in a locked location at the center. Session videos were deleted from the hard drive after secondary data was collected and procedural integrity was scored. At the end of the study, caregivers were provided with the opportunity to select any photos that they wished to keep. All photos were deleted from the external hard drive after they had been shared with the participant's caregiver.

## Procedure

**Instructional pre-assessment.** Prior to training, 20 staff employed at the autism treatment center were instructed to take a photo of a child. During each photo, the experimenter discreetly recorded the instruction that was used during the picture (e.g., "say cheese"). The most commonly used instructions were identified and variations of these instructions were used during generalization assessments. All photos taken during the instructional pre-assessment were immediately deleted by the experimenter. The results of the pre-assessment can be found in Table 1. The most commonly occurring instructions included one or more of the following words: "smile," "look," the child's name, and "cheese." Nine different variations of these instructions were determined, and were each presented once during generalization assessments. The nine instructions used in generalization assessments were the following: (a) "look at the camera," (b) "(child's name)," (c) "look here," (d) "(child's name) + smile," (e) "(child's name) + say cheese," (f) "smile," g) "say cheese," (h) "smile + (child's name)," and, (i) "smile and cheese."

**Reinforcer exposure sessions.** Several photo-related activities were available following a correct response in all training phases of this study. These activities included looking at oneself with filters on the Snapchat™ app, the Snow™ app, or the MSQRD™app; taking pictures with the camera; and embellishing images in the Fun Flics™, or the Paint on Photos ™apps. All photo-related apps were saved in the same folder on the smartphone. Prior to beginning training, the experimenter demonstrated how to play with each photo-related activity and then provided the participant with access to the activity. Three reinforcer-exposure sessions were conducted with each participant. To continue participation in the study, the participant had to select an app, and look or play with the app for at least 30 s during the third session. The photo-related activity was terminated when the participant stopped engaging in the activity for 5 s, or after 3 min had elapsed.

Prior to each training session, the photo-related apps folder was presented, and the participant had the opportunity to select a preferred photo activity. During the majority of sessions, all three participants typically selected the Snapchat™ app. Participants were closely monitored when apps were being used. During each session, the smartphone was disconnected from WI-FI to avoid any risk of photos being uploaded online. Any photos taken when the participant played with photo-related apps were deleted after the session.

**Generalization assessment.** Three generalization-assessment sessions were conducted: one before baseline and two after the participant had learned the terminal response. During the generalization assessment, the photographer presented nine naturalistic instructions that were identified in the pre-assessment. Each instruction was presented once, and each camera was used three times. To determine the order that the cameras were used, each camera was added to a list in Microsoft Excel™ three times. Each camera listed was paired with a randomly assigned number using the RAND function. The camera presentation order was then determined by putting the random list of numbers in order from lowest to highest. During generalization assessments, the photographer held up the camera in front of the participant's face and presented an instruction every 15 s. The photographer took the picture when the participant engaged in the target response or 3 s after issuing the instruction. The prompter was not present during generalization assessments so that the session better resembled more natural photo-taking settings. The photographer provided neutral feedback (e.g., "got it," "okay") after each trial during the first and second generalization assessments. During the third generalization assessment, correct responses resulted in social praise and being shown the picture. Photo-related activities were also presented on a variable ratio 4 schedule (VR4) in the third generalization assessment. The aim of the third generalization assessment was to determine if differences in responding were due to novel instructions or to motivation.

**Baseline.** Baseline sessions were conducted on six separate days. The instructions used during baseline rotated among the three different training instructions – "look," "smile," and "look and smile" – and the three different cameras. Each instruction was presented with each camera once, and the order that each pairing was presented was determined using the RAND function in Microsoft Excel™. For consistency, the prompter was present during baseline sessions; however, no prompts were provided. The photographer provided neutral feedback after each photo.

Correct responding during the last three baseline sessions determined each participant's placement in subsequent training phases. If the participant looked and smiled simultaneously (i.e., engaged in both responses at same time), on an average of 44% of trials or more the participant skipped ahead to compound-instruction training. If the participant did not meet compound-instruction criteria, they started with single-instruction training. For single-instruction training, the baseline averages across the two skills were considered separately and were used to determine the initial prompt level for training. A visual depiction of the procedure can be found in the decision-making flow chart in Appendix G.

**Single-instruction training.** The aim of single-instruction training was to teach the participant to respond to the instructions "look" and "smile" separately. Training sessions were conducted 3 to 4 days per week. If the participant was learning to follow both instructions, they had two separate training sessions in one day. The two training sessions were separated by at least a 1-hr break. Each session included 9 trials, and each trial within that session had the same instruction (i.e., "look" or "smile"). On each trial, the photographer took a picture 3 s after they gave the instruction, or sooner if the participant was engaging in the correct response. Each camera was used three times. The order in which the cameras were presented was randomized in the same manner as described for generalization assessments. Following a correct response, the photographer showed the participant the picture, delivered praise, and then engaged in the chosen activity with the participant for 30 s. If the participant incorrectly responded (i.e., current prompt level did not result in correct response), the prompter used the prompt from the previous level, and continued to move backwards up the prompt hierarchy (i.e., least-to-most prompting) until the participant engaged in the correct response. Following an error, the photographer gave neutral praise once the participant responded correctly, delivered no additional reinforcers, and presented the next trial 15 s later. A training phase was complete when the participant engaged in the correct response on 8 out of 9 trials across two consecutive sessions. Following the mastery of a prompt level, a terminal response probe was completed.

***"Look" sessions.*** A most-to-least prompting procedure, adapted from Krstovska-Guerrero and Jones (2013), was used to teach the participant to look at the camera lens within 3 s of the bid for attention. Responses were considered correct if the participant looked within 3 s following the prompt from their current level. The most-to-least prompt levels progressed in the following order: (a) the prompter swept their finger from the participant's eyes to the camera lens, (b) the prompter swept their finger from the participant's eyes halfway and then pointed to the lens from there, (c) the prompter waited 2 s, and if the participant did not look, pointed towards the lens from halfway between the participant and the photographer, and (d) no prompt was delivered. Look training began with level A if the looking average during the final three days of baseline was 49% or less, level B if the average was between 50-69%, and level C if the average was between 70-80%. If the average was 81 % or higher, the participant did not receive single-instruction training in looking.

***"Smile" sessions.*** Most-to-least prompting was used to teach the participant to smile within 3 s of the instruction "smile." Responses were considered correct if the participant smiled within 3 s following the prompt from their current teaching level. The most-to-least prompt levels progressed in the following order: (a) the prompter modeled a smile and gestured to their mouth, (b) the prompter modeled a smile, (c) the prompter waited 2 s after the instruction, and then modeled a smile, and (d) no prompt was delivered. Smile training began with level A if the smiling average during the final three days of the baseline was 49% or less, level B if the average was between 50-69%, and level C if the average was between 70-80%. If the average was 81% or higher, the participant did not receive single-instruction training in smiling.

***Eyes-open training (Maggie only).*** After two Level A smile training sessions, Maggie started to squeeze her eyes shut when she smiled. During the terminal probe in Session 10, Maggie smiled during seven trials, and in five of these trials her eyes were shut tightly. Maggie's mother was shown the pictures from Level A and reported that she found that Maggie's smile looked unnatural (i.e., large, forced smile with eyes squeezed shut). Maggie also did not readily respond to the instruction "open your eyes." Prior to moving to compound-instruction training, Maggie participated in additional prompt levels that aimed to teach her to smile with her eyes open. During the first revised prompt level (FP), Maggie was physically prompted to open her eyes while the prompter also modeled a smile. In this phase, the prompter placed their index finger at Maggie's eyebrow, their thumb at Maggie's cheekbone, and gently separated their fingers to open Maggie's eyes. A response was also considered correct if it occurred within 10 s on the instruction. After mastering level FP, Maggie returned to a revised Level A, referred to as R-A. Level R-A, followed the same procedures as described above; however, the definition of a correct smile was modified to include smiling with eyes open.

**Terminal response probe.** A participant's responding during a terminal probe determined the next phase and if relevant, the teaching level within that phase. Probe sessions were identical to baseline, with the exception that all trials used the instruction "look and smile." During the terminal response probe, a correct response was defined as simultaneously looking and smiling when having a picture taken. If the participant looked and smiled on at least 4 out of 9 trials, they moved to compound-instruction training. If the participant did not meet compound-instruction criteria, results for looking and smiling were considered separately. If the participant looked (or smiled) on 5 out of 9 trials, they moved to the subsequent prompt level. If the participant looked (or smiled) on 6 or 7 trials they skipped ahead to prompt level C, or moved to the next prompt level if already past this level. If the participant looked (or smiled) on 8 or 9 trials they mastered single-instruction training.

**Compound-instruction training.** Compound-instruction training began when the participant mastered the single-instruction training phase, or if the participant reached criteria during baseline or on a terminal response probe. The aim of compound-instruction training was to teach the participant to respond to the instruction “look and smile.” All other procedures were the same as single-instruction training. The most-to-least prompting levels progressed in the following order: (a) prompter swept their finger from participant’s eyes to the camera while modeling and pointing to her/his smile, (b) prompter swept their finger from the participant’s eyes halfway then pointed to the lens, while also modeling a smile, and (c) no prompts were delivered. If the participant looked and smiled on five trials or fewer during the terminal response probe, they moved to the subsequent prompt level. If the participant looked and smiled on 6 or 7 trials, they skipped to prompt level B or moved to the next level. If the participant looked and smiled on 8 out of 9 trials, they moved to the reinforcement schedule fading phase.

***Eyes-open training (Maggie only).*** Maggie’s eye closing reemerged during Sessions 33-36, and a revision was made to Maggie’s training procedure. During Level A training, Maggie would often copy the prompter’s model (i.e., smile with eyes open); however, when the prompter pointed towards the camera Maggie would squeeze her eyes shut. The revised prompt level (FP-15s) in Session 27 included a physical prompt and the following changes: (a) the flash on the

SLR camera was disabled, (b) the latency to correctly respond was increased to 15 s, (c) the prompter and photographer were combined into one role, and (d) edible items were available following a correct response. The prompter continued to sit in the same location and provided a model of the correct response; however, the prompter also now held a camera beside their face and took pictures. The individual who was previously the photographer sat behind Maggie and provided the physical prompt used in level FP (if Maggie closed her eyes). A response was correct if Maggie looked at the camera while smiling with her eyes open for at least 1 s. If Maggie closed her eyes after she engaged in a correct response, the trial continued until she engaged in another correct response. The purpose of this was to avoid reinforcing eye closing that occurred after the correct response. Following the Level FP-15s, the required latency was reduced to 8 s and no physical prompts were provided. This prompt level was referred to as R-8s.

***Point-blocking (Maggie only).*** After observing the pointing prompts during smile training, Maggie began to point to her mouth when she smiled. This behavior continued to occur after the prompts were removed and occurred during many of the trials in the compound-instruction training phase. After mastering the final compound-instruction prompt level, a point-blocking phase was implemented. Prior to each trial, Maggie was instructed to put her hands on her lap. During the trial, the prompter held their hands above Maggie's and blocked her from lifting them up. After this phase was mastered, Maggie continued to be instructed to put her hands down but pointing was no longer blocked.

**Reinforcement schedule thinning.** Schedule thinning began after the participant demonstrated skill mastery in the final level of compound-instruction training or during a terminal response probe. The aim of this phase was to fade out the photo-related activities and

Maggie’s edible items. The instruction during each trial was “look and smile,” and the photographer continued to rotate between the three different cameras. During this phase, correct responses continued to result in social praise and being shown the photo. Initially, the delivery of photo-related (and Maggie’s edible) consequences was thinned to a variable ratio 2 (VR2) schedule of reinforcement. The VR2 phase continued until the participant correctly responded on 8 out of 9 trials across two consecutive sessions. Next, the reinforcement schedule was thinned to a variable ratio 4 (VR4). Responses during the VR2 schedule were reinforced after 1 to 4 correct responses, and the responses during the VR4 schedule were reinforced after 1 to 7 correct responses. The list of numbers used during the VR2 and VR4 schedules of reinforcement were generated in Microsoft Excel™ using a macro developed by Bancroft and Bourret (2008).

**Follow up.** Follow-up sessions were conducted one month and three months after the final generalization assessment to evaluate skill maintenance. During follow-up sessions, correct responses were reinforced on the same schedule as the VR4 phase of reinforcement thinning.

## Social Validity Assessment

At the end of the study, the participant’s caregivers were presented with the first and last photo from baseline, schedule thinning, each generalization assessment, and the first and last photo from each of prompt levels that were implemented during training phases. Maggie’s assessment also included the first and last photo from the point-blocking phase. Caregivers were asked to review each photo and put them in order from least preferred to most preferred. The purpose of the assessment was to determine if caregivers observed socially significant changes in photo-related behaviors.

# Chapter III: Results

## Sarah

Sarah’s correct responding average during the last three days of baseline was 70% for looking and 26% for smiling. Given these baseline results, Sarah was required to participate in look training and smile training. Sarah was placed in Level C for look training, and Level A for smile training. A graphical display of Sarah’s results can be found in Figure 1. Sarah mastered Level C look training in three sessions. In the terminal response probe that followed, Sarah looked during 5 out of 9 trials. This placed Sarah in the next training level, which was Level D. Sarah mastered Level D after eight sessions.

Sarah required fewer sessions to complete look training than she did to complete smile training. Sarah mastered Level A smile training after eight sessions. During the subsequent terminal response probe, Sarah did not smile on any trials. Sarah continued on to Level B, and met mastery after seven sessions. Sarah moved on to the next prompting step (Level C) after smiling in 5 of the 9 trials during the terminal response probe. Sarah mastered Level C after four sessions.

During the probe in Session 29, Sarah simultaneously looked and smiled during 4 out of 9 sessions. These results placed Sarah in the compound-instruction phase. Sarah began training in prompt Level A, and mastered the level after 12 sessions. Sarah continued to Level B after she simultaneously looked and smiled in 6 out of 9 trials during the terminal response probe. Sarah completed Level B after seven sessions, and was placed in the Level C because she simultaneously looked and smiled during 4 out of 9 trials on the probe. After 15 sessions, Sarah met the mastery criteria for Level C. Prior to Level C, Sarah often copied the prompters model and pointed towards the camera. When the prompt was removed in Level C, this behavior stopped occurring by Session 56. After completing Level C, the reinforcement schedule was thinned to a VR2 and then a VR4. Sarah met mastery after four sessions in the VR2 phase, and three sessions in the VR4 phase.

Sarah looked at the camera in 33% of trials during the initial generalization assessment, and 77% of trials once she had completed training. When reinforcement for correct responding on a VR4 schedule was included, Sarah looked in 100% of trials. Sarah smiled in 33% of trials during the first assessment, and 56% of trials in the second assessment. When reinforcement for correct responding on a VR4 schedule was included, Sarah smiled in 67% of trials. For Sarah, looking and smiling appeared to occur as a behavior chain. Sarah typically did not smile unless she was already looking at the camera. For this reason, the findings for simultaneous looking and smiling are the same as the results for smiling. Sarah's response to each specific instruction can be found in Table 2 (Appendix I). After training, Sarah correctly responded to "look at the camera" and "Sarah, smile" in both generalization assessments. Sarah also responded to some other novel instructions, but only during one of the two after training assessments. During the 1-month follow-up session, Sarah looked in 100% in trials, smiled in 89% of trials, and simultaneously engaged in both responses during 89% of trials. During the 3-month follow-up session, Sarah looked, smiled, and simultaneously engaged in both responses during 89% of trials.

The social validity assessment was completed after the final generalization assessment. Sarah's mother was given a shuffled pile of 23 photos, and asked to put them in order from least to most preferred. The photo ranking completed by Sarah's mother can be found in Table 3

(Appendix I). The three least-preferred photos included the two earliest photos from the collection (i.e., Sessions 1 and 2). The top four preferred photos were all taken during the last five sessions (Sessions 74, 66, 65, and 70). Visual inspection of the photos revealed that in the five least-preferred photos, Sarah was not looking or orienting (i.e., head turned to the side) towards the camera in any of the photos. In the five top-ranked photos, Sarah was looking directly at the camera, smiling, and had her hands in her lap. The three photos ranked below this also included looking and smiling, but Sarah was pointing at the camera.

**Philip**

Philip's correct responding average during the last three days of baseline were 89% for looking and 11% for smiling. A graphical display of Philip's results can be found in Figure 2 (Appendix I). Philip was only required to complete smile training and he began training in prompt Level A. Philip mastered Level A in nine sessions. Philip moved on to Level B after smiling in 1 of the 9 terminal response probe trials. Philip finished Level B after eight sessions. During the Session 26 terminal probe, Philip simultaneously looked and smiled in 4 out of 9 trials, and consequently moved on to the compound-instruction training phase.

Philip mastered compound-instruction prompt Level A after eight sessions and continued to Level B after he simultaneously looked and smiled in 2 out of 9 terminal response probe trials. Philip mastered Level B after two sessions. Philip correctly responded in 7 out of 9 terminal response trials, and continued on to the final prompt level. After three sessions, Philip mastered the final prompt level and the reinforcement schedule was thinned. After nine sessions of low-stable data in the VR2 phase, two new photo-related activities were introduced into Philip's sessions. The new activities included a new phone (i.e., Samsung Galaxy™) and teaching Philip how to watch videos in fast forward. With the availability of the new activities on the VR2 schedule, Philip mastered the phase after four sessions. These new activities were also present during the VR4 phase, and Philip met mastery criteria after four sessions.

Philip did not participate in look training and his responding remained stable across all three generalization assessments. Philip looked at the camera during 89%, 78%, and 89% of trials during the three generalization assessments. Philip smiled at the camera in 11% of trials during the initial probe, and this increased to 56% once he had completed training. When reinforcement for correct responding on a VR4 was included, Philip smiled in 44% of trials. Similar to Sarah, looking and smiling appeared to also occur as a behavior chain for Philip. Philip typically did not smile unless he was already looking at the camera, so his findings for simultaneous looking and smiling were also the same as his results for smiling. After training, Philip correctly responded to "(his name)" on both generalization assessments. Similar to Sarah, Philip also responded to some other novel instructions, but only during one of the two after training assessments. Philip's response to each specific instruction can be found in Table 2. During 1-month and 3-month follow up, Philip looked in 100% of trials, smiled in 44% of trials, and simultaneously engaged in both responses in 44% of trials

Philip's social validity assessment included 18 photos. The photo-ranking completed by Philip's father can also be found in Table 3 (Appendix I). The two earliest photos (i.e., Sessions 1 & 2) were ranked as the two least-preferred photos. The top three preferred photos were all from the later part of looking and smiling training and a VR2 session. Visual inspection of the photos revealed in the five least-preferred photos, Philip was smiling in one photo, but not looking in any of the photos. Two of these photos were also blurry because Philip was moving when the photo was taken. In the five top-ranked photos, Philip was smiling and looking at the camera in every photo.

**Maggie**

Maggie’s correct responding average during the last three days of baseline was 63% for looking and 30% for smiling. Given these results, Maggie was required to participate in look training and smiling training. Maggie was placed in Level B for look training and Level A for smile training. Maggie mastered prompt Level B for look training and prompt Level A for smile training after two training sessions. Maggie quickly acquired the smile response; however, in 8, 7, and 5 trials during Sessions 8, 9, and 10, respectively, Maggie had her eyes tightly closed. After Session 10, the definition of a correct smile for Maggie was revised to include smiling with eyes open. To teach Maggie to keep her eyes open when she smiled, Maggie participated in two additional prompt levels (i.e., Level FP and R-A). Maggie mastered the FP Level after six sessions, and mastered the R-A Level after 12 sessions.

During the terminal response probe in Session 29, Maggie simultaneously looked and smiled (with her eyes open) during 5 out of 9 trials. Given these results, Maggie moved forward to the compound-instruction training phase. During the initial two Level A prompting sessions, Maggie kept her eyes open when she looked and smiled towards the camera. In Session 32, the flash went off during the first SLR camera trial, and Maggie shut her eyes. Following this, Maggie closed her eyes on the two other SLR camera trials, and once when the iPhone™ was used. In Session 33, Maggie kept her eyes open during the first three trials; however, on the fourth trial the SLR flash went off and Maggie closed her eyes. After the fourth trial, Maggie tightly closed her eyes in all subsequent photos. During Sessions 34 to 36, Maggie closed her eyes during most trials. During these sessions, Maggie smiled with her eyes open when orienting towards the prompter; however, when the prompter pointed towards the camera lens, Maggie would close her eyes. The FP-15s revision described in the procedures section was introduced in Session 37. Maggie reached mastery criteria for this level in four sessions. Eye closing continued to occur during the terminal response probe in Session 41. In the revised level that followed, the prompter continued to model the correct response and take pictures; however, Maggie had to engage in the correct response without a full physical prompt and within 8 s of the instruction. Maggie mastered the R-8s Level in two sessions, and a reduction in eye closing was seen during the subsequent terminal response probe.

Maggie was returned to the regular teaching procedure in Session 45; however, the definition of a correct response continued to include smiling with eyes open and edible items continued to be available after a correct response. Maggie mastered Level B after two sessions, and continued on to the final level after she simultaneously looked and smiled in seven terminal response probe trials. Throughout training, Maggie often copied the prompters model and pointed to her mouth when she smiled. Maggie mastered the no prompt level after four sessions; but in most of these pictures Maggie was pointing to her smile. To reduce pointing, Maggie participated in an additional training phase where she was fully prompted to keep her hands on her lap. Maggie mastered the first prompt level in two sessions, and continued to keep her hands down when the prompt was removed in Session 55. At this point, the reinforcement schedule was thinned to a VR2 and then a VR4. The target response maintained during schedule thinning, and Maggie finished each phase after two sessions.

Maggie looked at the camera in 78% of trials during the initial generalization assessment, and 89% of trials once she had completed training. When reinforcement for correct responding on a VR4 schedule was included, Maggie looked in 100% of trials. Maggie smiled in 33% of trials during the first assessment, and 89% of trials in the second assessment. When reinforcement for correct responding on a VR4 schedule was included, Maggie also smiled on 89% of trials. Simultaneous looking and smiling occurred during 33% of trials in the initial generalization assessment, and 67% of trials once training was complete. When reinforcement for correct responding on a VR4 schedule was included Maggie simultaneously looked and smiled during 89% of trials. Similar to Sarah and Philip, Maggie typically looked at the camera lens before she smiled. Maggie's results for smiling and the terminal response sometimes differed though because of eye closing. If Maggie did not smile with her eyes open, the terminal response was scored as incorrect. After training, Maggie correctly responded to "look at the camera," "say cheese," "(name) say cheese," "smile and cheese," and "smile (name)" in both generalization assessments. These results can be found in Table 2 (Appendix I). During the 1-month follow-up session, Maggie looked, smiled, and simultaneously engaged in both responses during 100% of trials. Due to time constraints, a 3-month follow up was not completed with Maggie.

Maggie's social validity assessment included 30 pictures. The photo-ranking completed by Maggie's mother can be found with Sarah and Philip's results in Table 3 (Appendix I). The four least-preferred photos included the two earliest photos (Sessions 1 and 2) and two photos from the start of single instruction training. The top three preferred photos were all taken within the last 11 sessions of the study. In the five least-preferred photos, Maggie was looking at the camera in two photos, not smiling in any photos, and in two of these photos Maggie was covering her ears with her arms. In the top five ranked photos, Maggie was smiling and orienting towards the camera in every picture. Maggie also had her eyes open in the top four ranked photos, and had her hands down in the two most preferred photos.

## Chapter IV: Discussion

Previous research suggests that children with ASD may have difficulty orienting their attention to social stimuli (e.g., Courchesne et al., 1994; Dawson et al., 1998; Dawson et al., 2004; Landry & Bryson, 2004; Leekam & Ramsden, 2006; Maestro et al., 2002; Osterling & Dawson, 1994; Swettenham et al., 1998). Participating in photos requires that an individual respond to non-specific social stimuli (e.g., "say cheese" in the presence of a camera) with a very specific set of responses (i.e., looking and smiling at a camera), yet skill barriers that are commonly associated with the ASD diagnosis may prevent an individual from naturally learning photo-related behaviors. Learning photo-related behavior is vital to accessing many life events that require photo identification, like travel or a driver's license. Similarly, the interest of 14 different families in this study further suggests that the acquisition of this skill is highly valued by many parents.

Presently, no known behavioral research has taught children diagnosed with ASD to participate in photos. Previous research has successfully, however, taught autistic children to look and smile in response to bids for shared attention (Krstovska-Guerrero & Jones, 2013). Krstovska-Guerrero and Jones (2013) taught this skill by teaching each component skill separately, and then chaining them together using most-to-least prompting levels (Krstovska-Guerrero & Jones, 2013). The present study attempted to teach photo-related behavior by teaching the two responses separately and then chaining them together using a DTT teaching package with naturalistic consequences. The DTT teaching package was effective in teaching Sarah, Philip, and Maggie to look and smile when having their photo taken.

Maggie required some additional prompts to reduce two undesired photo-behaviors (i.e., closing eyes and pointing to smile); however, she was able to successfully acquire the terminal response in a similar time frame to the other two participants. A random selection of photos from across the study also revealed that skill improvements were observable within photos by the caregivers of each participant. Similarly, some parents also noted observing skill improvements in untargeted areas, such as Sarah keeping her hands down, and Philip sitting still during the photo.

At 1-month follow-up, Sarah engaged in the terminal response during 89% of trials and Maggie engaged in the terminal response during 100% of trials. Sarah and Maggie's results during 1-month follow up, and Sarah's results during 3-month follow up were significantly higher than Philip's. During both follow-up sessions, Philip looked and smiled during 44% of trials. Philip's results did, however, remain above his baseline average of 15%. During the photo ranking, Philip's father also stressed that sitting still and looking into the camera were of most value to him, and Philip engaged in these two responses during 100% of trials at 1-month and 3-month follow up. Due to time constraints, 3-month follow up data were not collected for Maggie. The inability to compare Maggie's 3-month follow up results to Sarah and Philip's is one limitation of this study.

One additional benefit of participating in this study was that photos became a preferred activity for each participant. Sarah, Philip, and Maggie all frequently asked the experimenter and/or photographers to take pictures. Identifying idiosyncratic interests and incorporating them into the naturalistic consequence greatly increased Sarah and Philip's motivation to play with the photo-related activities. Prior to identifying these interests, Sarah and Philip would only occasionally attend to the camera-related activity. Sarah enjoyed listening to videos with high-pitched audio that were made using the "voice changer" function on Snapchat™. Typically, these videos included the adult counting down from ten or three and tickling Sarah. This interest was first identified during Session 40. Philip enjoyed using Snapchat™ to videotape electronic toys. Philip saved all these short video clips onto the phone and watched the whole collection on repeat. Philip also enjoyed watching the electronic toy videos in fast-forward, which was taught to Philip during the VR2 revision. A specific interest was not identified for Maggie, and Maggie only occasionally attended to the camera-related activities. During the 30 s break, Maggie would often play with toys in the room (e.g., puzzle, car ramp), or jump from a step into the prompter's arms. To increase Maggie's motivation, a small candy was introduced as possible consequence during Session 37.

Interest in the naturalistic consequences appeared to influence the results for Sarah and Philip. After acquiring the look and smile response, Sarah maintained the skill during reinforcement schedule thinning and at follow-up. These findings may be due to fact that Sarah's preferred interests were social (e.g., tickling) and they remained available on a continuous schedule. Philip's findings differed from Sarah, as he quickly acquired the look and smile response; however, the introduction of a new camera-related activity was required to increase responding during schedule thinning. Similarly, Philip's 1-month follow-up results may have been influenced by recent technological failures with the cameras. During the final generalization assessment, Philip tried to upload a video to the internet but the upload was unsuccessful (because the WI-FI was turned off). At this time, Philip cried, repeatedly said "phone is broken," and refused to independently leave the room at the end of the session. During the follow-up session, Philip continued to say that the phone was broken and instructed the photographer to put it away. During the 1-month follow-up session, the iPhone battery also ran out and had to be replaced with a different iPhone. Throughout the session, Philip made many repeated vocal statements about the broken phone, and the photographer had difficulty maintaining his attention. The camera problems during the final generalization assessment and 1-month follow up may have influenced Philip's motivation and consequently his responses.

The terminal response learned during this study also appeared to generalize to some untrained instructions. Sarah, Philip, and Maggie all correctly responded to instructions that they had not responded to during the initial generalization assessment. One potential explanation for response generalization is that many of the untrained stimuli included an instruction from training (i.e., look or smile) or a familiar social stimulus (i.e., say cheese, or their name). Gathering commonly used instructions from ABA frontline workers may have also skewed the findings, as this population is trained to use clear and specific instructions. Future research may benefit from sampling another population for photo-related instructions, such as parents of children who are diagnosed with ASD.

One limitation of this study is that it employed an AB design. In a AB design, the experimental effect is not replicated (Barlow, Nock, & Herson, 2009). The inclusion of terminal response probes in this study did, however, serve to some extent as a mini-reversal. Furthermore, though increases in looking, smiling, and simultaneously engaging in both responses were seen once single-instruction training began, mastery of each target response was only achieved after specific training was applied to it.

One additional limitation of this study was that it took a large number of sessions to teach the terminal response. Sarah, Philip, and Maggie required 65, 51, and 53 sessions to acquire to the terminal response. When a participant looked and smiled after an adult made a bid for attention, Krstovska-Guerrero and Jones (2013) delivered a preferred toy or edible. Participants in the Krstovska-Guerrero and Jones study were able to acquire the look and smile response after 18, 22, and 38 training sessions. The present study attempted to use consequences that related to the activity; however, they appeared to become more reinforcing for Sarah and Philip when their own interests were incorporated. Similarly, both of these participants also appeared to prefer the audio from videos over the photo-related components of the activities. Maggie only occasionally attended to images of herself on Snapchat, and preferred edibles were eventually also introduced as a consequence for correct responding. When edible items were introduced as a potential consequence, Maggie quickly progressed through each subsequent level. Maggie also continued to engage in the terminal response at mastery criterion level when the edible reinforcement schedule was thinned. Considering that participants in Krstovska-Guerrero and Jones (2013) were able to acquire a similar response in significantly fewer sessions, and that adjustments had to be made to the naturalistic consequences in this study, future research would benefit from conducting preference assessments to identify idiosyncratic reinforcers earlier. Comparing length of skill acquisition and maintenance when naturalistic consequences are used and when unrelated preferred items or edibles may also be beneficial in future studies.

Krstovska-Guerrero and Jones (2013) used a finger sweep to teach looking and tickling to teach smiling. Given the potential reinforcing value of tickles, this study chose to use model and gesture prompts to teach smiling instead. Two of the participants in this study often copied these gestural prompts. During training, Sarah often pointed to the camera lens and Maggie pointed to her smile. These responses were not blocked during regular training. When the finger sweep towards the lens was discontinued, Sarah stopped regularly engaging in the response after five sessions without the prompt. Maggie continued to point to her smile during the final four no-prompt sessions. Maggie required only two sessions to reduce pointing; however, future research may benefit from blocking responses similar to these from the onset.

Lastly, the findings of this study suggest that motivation plays a significant role in teaching and maintaining photo-related behaviors. In this study, five prospective participants were excluded because they appeared to have previously acquired the terminal response. When told this information many parents reported that their child did not engage in this response when the parent tried to take a photo of their child. The findings of this study demonstrated that children who are diagnosed with ASD can learn to look and smile, and also that interest in photo participation can be enhanced by pairing photos with preferred activities. Children who have acquired the terminal response but avoid engaging in the response, may therefore benefit from participating in activities that aim to pair portrait photography with preferred activities. Furthermore, considering the popularity of group photos, future research should assess if photo-related behavior taught individually generalizes to a group setting, and if not, assess procedures for teaching this skill.

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# Appendices

## Appendix A: Eligibility Form

Client:____________________________

1. Diagnosis:______________________

2. Sits for 30 seconds when instructed/ not engaged in a preferred activity:

   Observation 1: _____
   Observation 2: _____

3. Responds to their name by either ceasing an activity, looking up or making eye contact
   Observation 1: ______
   Observation 2: ______
   Observation 3: ______
   Observation 4: ______
   Observation 5: ______

4. Imitate a smile
   Observation 1: ______
   Observation 2: ______

5. Does the participant have previous training in this skill area? ______

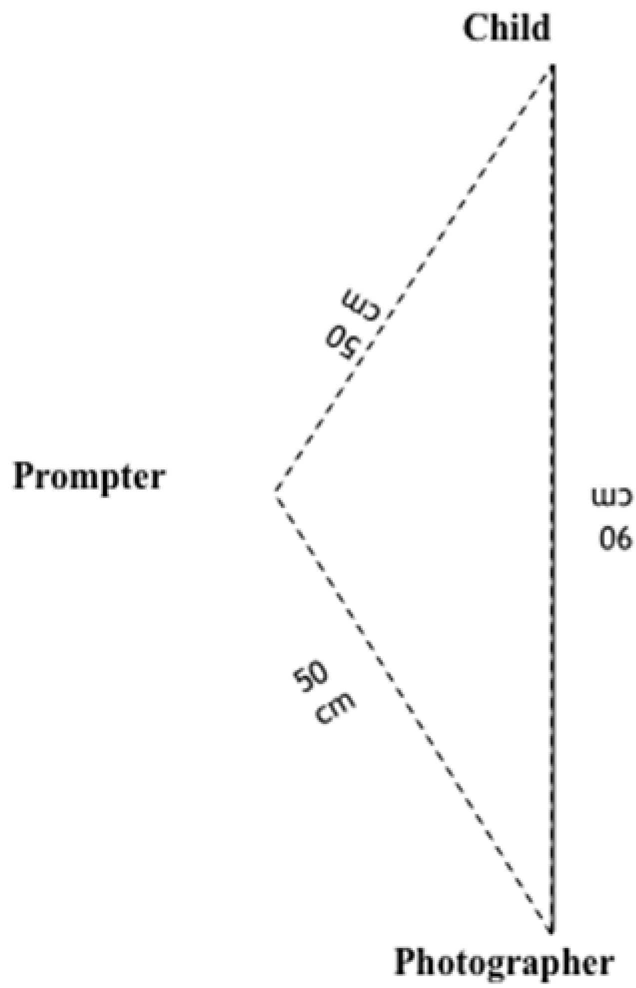
6. Does the participant have severe problem behavior that could disrupt learning the target skill (e.g., elopement)? _________

Further exclusions

1. Any participant who looks and smiles at the camera on more than 5 out of 9 trials during the initial generalization assessment.

2. The participant must engage with a photo-related activity for at least 30 s (i.e., show interest) during each reinforcer exposure session, and select an activity during the third session.

## Appendix B: Diagram of Positions for Photos



# Appendix C: Sample Data Sheet

| | | | | | | |
|---|---|---|---|---|---|---|
| **Participant:** | | **Phase:** | | **Primary / IOA** | | |
| **Date:** | | **Initials:** | | **Session #:** | | |
| **Level:**<br>**Instruction:** | | | | | | |
| | **CAMERA** | **LOOKS** | | **SMILES** | | **At same time?** |
| **1** | | Y | N | Y | N | |
| **2** | | Y | N | Y | N | |
| **3** | | Y | N | Y | N | |
| **4** | | Y | N | Y | N | |
| **5** | | Y | N | Y | N | |
| **6** | | Y | N | Y | N | |
| **7** | | Y | N | Y | N | |
| **8** | | Y | N | Y | N | |
| **9** | | Y | N | Y | N | |
| **Total** | | | | | | |
| **% Correct** | | | | | | |

# Appendix D: Procedural Integrity Checklist

**Date: ______________ Participant: __________ Instructor: ________**

**Photographer**

**Generalization assessment**

| | | | |
|---|---|---|---|
| 1. | Sits 90 cm from participant | Y | N |
| 2. | Holds camera up in front of face | Y | N |
| 3. | Use correct camera | Y | N |
| 4. | Says correct instruction | Y | N |
| 5. | Takes picture after 3 s, or sooner, if correct response | Y | N |
| 6. | Provides neutral comments (e.g., done, got it) | Y | N |
| 7. | Presents next trial after 15 seconds or less | Y | N |
| 8. | Completes 9 trials in total | Y | N |

**Total % Correct: ________**

**Baseline**

| | | |
|---|---|---|
| 1. Sits 90 cm from participant | Y | N |
| 2. Holds camera up in front of face | Y | N |
| 3. Use each camera 3 times | | |
| a. Iphone | Y | N |
| b. SLR | Y | N |
| c. Ipad | Y | N |
| 4. Says instruction | | |
| a. “Look” x 3 | Y | N |
| b. “Smile” x 3 | Y | N |
| c. “Look and smile” x 3 | Y | N |
| 5. Takes photo after 3 seconds, or sooner, if correct | Y | N |
| 6. Provides neutral comments (e.g., done, got it) | Y | N |
| 7. Presents next trial after 15 seconds or less | Y | N |
| 8. Completes 9 trials in total | Y | N |

**Total % Correct: _________**

**Terminal probe**

| | | |
|---|---|---|
| 1. Sits 90 cm from participant | Y | N |
| 2. Use each camera 3 times | | |
| a. Iphone | Y | N |
| b. SLR | Y | N |
| **c.** Ipad | Y | N |
| 3. Say “look and smile” on each trial | Y | N |

| | | |
|---|---|---|
| 4. Takes photo after 3 seconds, or sooner, if correct | Y | N |
| 5. Provides neutral comments (e.g., done, got it) | Y | N |
| 6. Presents next trial after 15 seconds or less | Y | N |
| 7. Completes 9 trials in total | Y | N |

**Total % Correct: _________**

**Treatment for "Look"**

| | | | |
|---|---|---|---|
| **1.** Conduct preference assessment at start of session | Y | N | |
| 2. Kneels 90 cm from participant | Y | N | |
| 3. Holds camera up in front of face | Y | N | |
| 4. Use each camera 3 times | | | |
| a. Iphone | Y | N | |
| b. SLR | Y | N | |
| c. Ipad | Y | N | |
| 5. Says "look" on each trial | Y | N | |
| 6. Takes picture after 3 s, or sooner, if correct response | Y | N | |
| Correct response: | | | |
| 1. Shows picture to child | Y | N | N/A |
| 2. Delivers enthusiastic praise | Y | N | N/A |
| 3. Engages child in photo related activity for 30 s | Y | N | N/A |
| 4. Presents next trial 15 seconds or less | Y | N | N/A |
| Incorrect response: | | | |
| 1. Delivers neutral feedback | Y | N | N/A |
| 2. Presents next trial after 15 seconds or less | Y | N | N/A |

**Total % Correct: _________**

**Treatment for "Smile"**

| | | | |
|---|---|---|---|
| **1.** Conduct preference assessment at start of session | Y | N | |
| 2. Kneels 90 cm from participant | Y | N | |
| 3. Holds camera up in front of face | Y | N | |
| 4. Use each camera 3 times | | | |
| a. Iphone | Y | N | |
| b. SLR | Y | N | |
| c. Ipad | Y | N | |
| 5. Says "smile" on each trial | Y | N | |
| 6. Takes picture after 3 s, or sooner, if correct response | Y | N | |
| Correct response: | | | |
| 1. Shows picture to child | Y | N | N/A |
| 2. Delivers enthusiastic praise | Y | N | N/A |
| 3. Engages child in photo related activity for 30 s | Y | N | N/A |

| | | | |
|---|---|---|---|
| 4. Presents next trial | Y | N | N/A |
| Incorrect response: | | | |
| 1. Delivers neutral feedback | Y | N | N/A |
| 2. Presents next trial after 15 seconds | Y | N | N/A |

**Total % Correct: _________**

**Treatment for "Look and smile"**

| | | |
|---|---|---|
| **1.** Conduct preference assessment at start of session | Y | N |
| 2. Kneels 90 cm from participant | Y | N |
| 3. Holds camera up in front of face | Y | N |
| 4. Use each camera 3 times | | |
| a. Iphone | Y | N |
| b. SLR | Y | N |
| c. Ipad | Y | N |
| 5. Says "look and smile" on each trial | Y | N |
| 6. Takes picture after 3 s, or sooner, if correct response | Y | N |

| | | | |
|---|---|---|---|
| Correct response: | | | |
| 1. Shows picture to child | Y | N | N/A |
| 2. Delivers enthusiastic praise | Y | N | N/A |
| 3. Engages child in photo related activity for 30 s | Y | N | N/A |
| 4. Presents next trial after 15 seconds or less | Y | N | N/A |
| Incorrect response: | | | |
| 1. Delivers neutral feedback | Y | N | N/A |
| 2. Presents next trial after 15 seconds or less | Y | N | N/A |

**Total % Correct: ________**

**Prompter**

**Generalization assessment** N/A

**Baseline/Terminal Response Probe**

| | | |
|---|---|---|
| 1. Sits/kneels to left side of camera | Y | N |
| 2. Sits 50 cm from camera and participant | Y | N |
| 3. Does not provide any prompts | Y | N |

**Total % Correct: ________**

**Treatment for "Look"**

| | | | |
|---|---|---|---|
| 1. Sits/kneels to left side of camera | Y | N | |
| 2. Sits 50 cm from camera and participant | Y | N | |
| Error correction: | | | |
| 1. If child errors, uses least to most intrusive prompts | Y | N | N/A |
| Level A (most intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Sweeps finger from the child's eyes to the camera lens | Y | N | |
| Level B | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Sweeps finger from the child's eyes for 45 cm | Y | N | |
| 3. Points to the lens from the 45 cm mark | Y | N | |
| Level C (least intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Waits 2 seconds | Y | N | |
| 3. If no look, points towards the lens from the 45 cm mark | Y | N | |
| Level D (no prompt) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Waits 2 seconds | Y | N | |
| 3. Only provides prompts if participant errors | Y | N | |

**Total % Correct: ________**

**Treatment for "Smile"**

| | | | |
|---|---|---|---|
| 1. Sits/kneels to left side of camera | Y | N | |
| 2. Sits 50 cm from camera and participant | Y | N | |
| Error correction: | | | |
| 1. If child errors, uses least to most intrusive prompts | Y | N | N/A |
| Level A (most intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Models a smile and points to mouth | Y | N | |
| Level B | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Models a smile | Y | N | |

| | | | |
|---|---|---|---|
| Level C (least intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Waits 2 seconds before model | Y | N | |
| 3. Models a smile | Y | N | |
| Level D (no prompt) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Waits 3 seconds | Y | N | |
| 3. Only provides prompts if participant errors | Y | N | |

**Total % Correct: ________**

**Treatment for "look and smile"**

| | | | |
|---|---|---|---|
| 1. Sits/kneels to participants right side | Y | N | |
| 2. Sits 50 cm from camera and participant | Y | N | |
| Error correction: | | | |
| 1. If child errors, uses least to most intrusive prompts | Y | N | N/A |
| Level A (most intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Sweep finger from child's eyes to the camera | Y | N | |
| 3. Models and points to smile | Y | N | |
| Level B (least intrusive) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Sweep finger from the child's eyes for 45 cm | Y | N | |
| 3. Points to camera lens from 45 cm mark | Y | N | |
| 4. Models a smile while sweeping finger & pointing | Y | N | |
| Level C (no prompt) | | | |
| 1. Waits for photographer to give instruction | Y | N | |
| 2. Waits 2 seconds | Y | N | |
| 3. Only provides prompts if participant errors | Y | N | |

## Appendix E: Procedural Integrity Checklist – Maggie only

### Single-Instruction Training

**Correct response:** Smiles with eyes open, eyes do not need to be oriented towards camera lens.

### Photographer

**Treatment for "Smile"**

| | | | |
|---|---|---|---|
| 1. Conduct preference assessment at start of session | Y | N | |
| 2. Kneels 90 cm from participant | Y | N | |
| 3. Holds camera up in front of face | Y | N | |
| 4. Use each camera 3 times | | | |
| a. Iphone | Y | N | |
| b. SLR | Y | N | |
| c. Ipad | Y | N | |
| 5. Says "smile" on each trial | Y | N | |
| 6. Takes picture after 10 s, or sooner, if correct response | Y | N | |

Correct response:

| | | | |
|---|---|---|---|
| 1. Shows picture to child | Y | N | N/A |
| 2. Delivers enthusiastic praise | Y | N | N/A |
| 3. Engages child in photo related activity for 30 s | Y | N | N/A |
| 4. Presents next trial | Y | N | N/A |

Incorrect response:

| | | | |
|---|---|---|---|
| 1. Delivers neutral feedback | Y | N | N/A |
| 2. Presents next trial after 15 seconds | Y | N | N/A |

**Total % Correct: ________**

### Prompter

Full Prompt Training Level (FP):

| | | |
|---|---|---|
| 1. Waits for photographer to give instruction | Y | N |
| 2. Physically prompt participant to open eyes | Y | N |
| 3. Models opening eyes while smiling | Y | N |

Revised Level A (R-A):

| | | |
|---|---|---|
| 1. Waits for photographer to give instruction | Y | N |
| 2. Models a smile and points to mouth | Y | N |

**Total % Correct: ________**

## Compound-Instruction Training

**Correct response:** Look and smiling at the camera, without squeezing eyes shut.

### Photographer

**Treatment for "Smile"**

| | | | |
|---|---|---|---|
| 1. Conduct preference assessment at start of session | Y | N | |
| 2. Sits to participant's right side | Y | N | |
| 3. Holds camera under chin/face | Y | N | |
| 4. Use each camera 3 times | | | |
| a. Iphone | Y | N | |
| b. SLR | Y | N | |
| c. Ipad | Y | N | |
| 5. Says "look and smile" | Y | N | |
| 6. Models smiling with eyes open while pointing to face | Y | N | |
| **FP-15s Level:** | | | |
| 1. Takes pictures for 15 seconds, or until correct response occurs with a full prompt | Y | N | |
| **R-8s Level:** | | | |
| 1. Takes picture for 8 seconds, or until correct response occurs | Y | N | |
| **Correct response:** | | | |
| 1. Shows picture to child | Y | N | N/A |
| 2. Delivers enthusiastic praise | Y | N | N/A |
| 3. Engages child in photo related activity for 30 s | Y | N | N/A |
| 4. Presents next trial within 15s | Y | N | N/A |
| **Incorrect response:** | | | |
| 1. Delivers neutral feedback | Y | N | N/A |
| 2. Presents next trial after 15 seconds | Y | N | N/A |

**Total % Correct: ________**

**Prompter**

FP-15s Level:

1. Prompts eyes open if participant closes eyes Y N

R-8s Level*:* Extended time (Incorrect with full prompt)

1. Waits 8 s Y N
2. If participant does not engage in correct response, full prompts to open eyes Y N

**Total % Correct: ________**

## Appendix F: Kappa Coefficient Calculation

**Researcher**

**Integrity data collector**

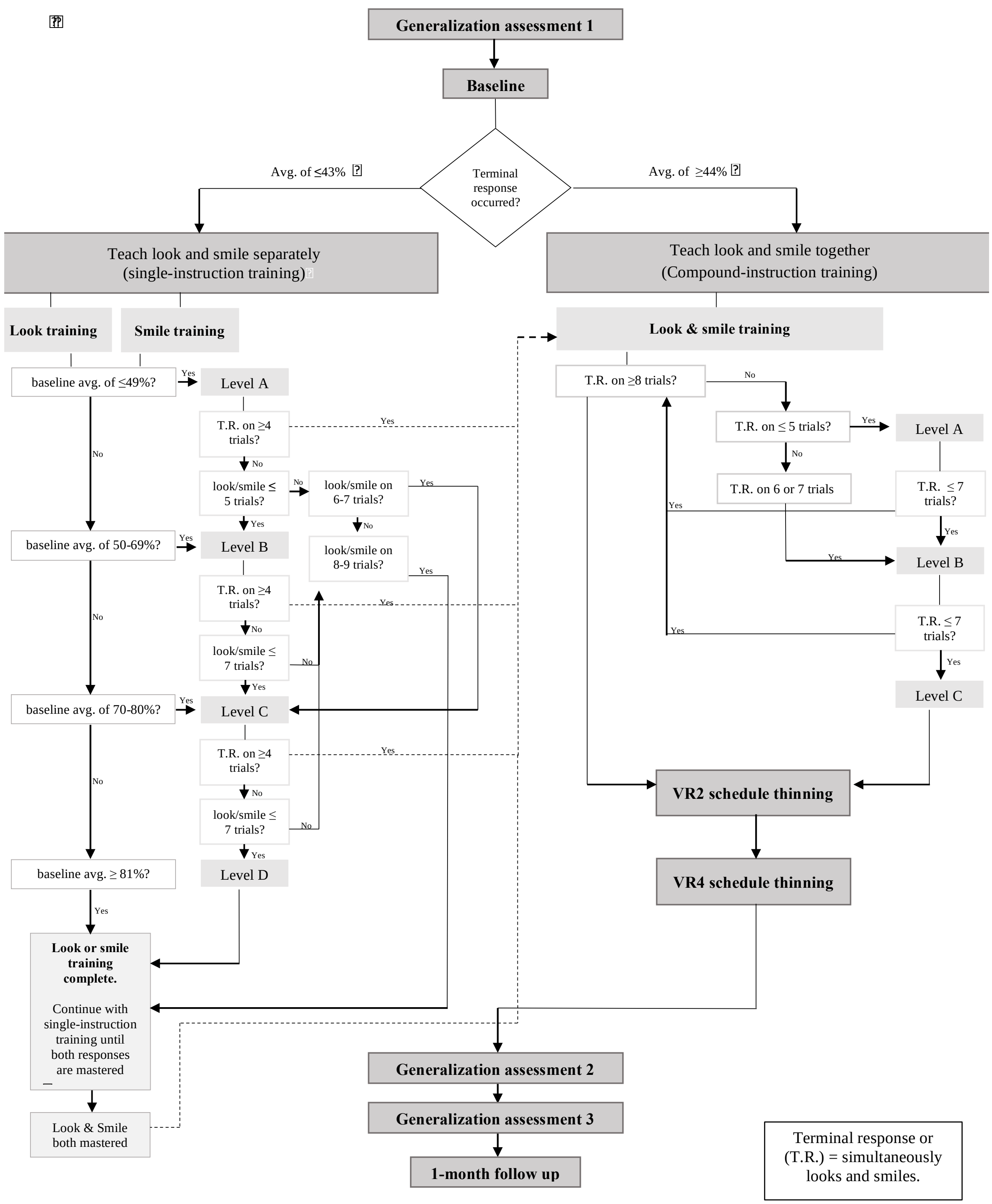
| | Yes | No | |
|---|---|---|---|
| Y | $A_1$ | $D_2$ | $Y_1 =$ |
| N | $D_1$ | $A_2$ | $Y_2 =$ |
| | $X_1 =$ | $X_2 =$ | $N =$ |

$$\text{Kappa} = \frac{(P_0 - P_C)}{(1 - P_C)}$$

$$P_O = \frac{A_1 + A_2}{A_1 + A_2 + D_1 + D_2}$$

$$P_C = \left(\frac{X_1 \times Y_1}{N}\right) + \left(\frac{X_2 \times Y_{12}}{N}\right)$$

# Appendix G: Procedure Decision-Making Flowchart



# Appendix H: IRB Approved Consent Form

ST. CLOUD STATE UNIVERSITY

St. Cloud State University
Institutional Review Board
Approval date: 01/30/17
Expiration date: 01/29/18

**Teaching Children with Autism to Look and Smile while having a Photo Taken**
**Parental/Guardian Consent Form**

Your child is invited to participate in a research study about teaching children with Autism to look and smile while having their photo taken.

The aim of this study is to determine if children with Autism can be taught to look and smile while having their picture taken, by breaking the skill down into separate teaching steps. This study will also examine if this skill can be taught using photo-related activities as the consequence for correctly engaging in the skill. To teach the skill, the study will use prompts that are regularly used during ABA programming, such as models or gestures. If you agree to be part of the research study, your child will be asked to participate in two brief daily training sessions on 2 or 3 days a week.

During this study, photos will be taken of your child using three different types of cameras. Data collected will remain confidential. Participants will be assigned pseudonyms, and no identifying demographic information will be shared in the report. At the end of the study, you will be asked to rank photos that were taken at various points in the study, and Ivy La Rue will review your child's progress in the study with you. The final version of the thesis will also be publicly available, and will be found in the REPOSITORY at St. Cloud State University.

Teaching your child to engage in photo-related behaviors may lead to participation in family and school photos as well as photos used for identification (e.g., passport). One potential risk associated with this study is unautherized photo-sharing. To reduce the risk of any photo-sharing, research cameras will be kept in a locked cabinent at Breakthrough Autism Inc. for the duration of the study. Any cameras that are able to connect to the internet (e.g., smartphone) will be disconnected from the internet for the whole duration of the study. Photos and videos collected will also not appear in publications or educational/professional presentations, unless informed consent for the release and authorization of these photographs or videos has been granted. To release any photos or videos, parents will have to complete a separate informed consent form, and there will be no penalty for not granting informed consent to use said materials.

Participating in this study is completely voluntary. You and/or your child can withdraw at any time any penalty. The decision whether or not to participate will not affect your or your child's current or future relations with Breakthrough Autism Inc., St. Cloud State University, or Ivy La Rue.

If you or your child have questions about this research study, please contact Ivy La Rue (416-901-8478) or Dr. Michele Traub (320-308-2043). Results of the study can be requested from Ivy La Rue.

Your signature indicates that you and your child have read the information provided here and have decided to participate. You or your child may withdraw from the study at any time without penalty after signing this form.

Student Name (Printed) ______________________    Parent(s')/Guardian(s') Name (Printed) ______________________

Parent(s')/Guardian(s') Signature ______________________    Date ______________________

**Appendix I: Tables and Figure**

Table 1

*Instructions Used by Front-Line Staff when Taking a Photo of a Child*

| Instruction | Total Number of Times Used |
|---|---|
| "Smile" | 6 |
| "Really big smile, okay" | 1 |
| "(child's name). smile" | 1 |
| "Smile + cheese" | 1 |
| "Smile+ say cheese" | 1 |
| "(Child's name) + cheese" | 1 |
| "Cheese" | 1 |
| "Say cheese" | 2 |
| "(Child's name) + look" | 1 |
| "Look over here" | 1 |
| "Look at the camera" | 1 |
| "Put your tongue inside" | 1 |
| No instruction | 2 |

Table 2

*Instructions that Participants Correctly Responded to During Generalization Assessments*

| | Sarah | | | Philip | | | Maggie | | |
|---|---|---|---|---|---|---|---|---|---|
| | Gen.1 | Gen. 2 | Gen. 3 | Gen.1 | Gen. 2 | Gen. 3 | Gen. 1 | Gen. 2 | Gen. 3 |
| Look at the camera | No | Yes | Yes | No | Yes | No | No | Yes | Yes |
| Child's name | No | No | Yes | No | Yes | Yes | Yes | Yes | Yes |
| Say cheese | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes |
| Name + say cheese | No | No | Yes | Yes | Yes | No | No | Yes | Yes |
| Look here | No | No | Yes | No | No | No | Yes | No | Yes |
| Smile | Yes | Yes | No | No | No | Yes | No | No | Yes |
| Name + smile | No | Yes | Yes | No | No | Yes | Yes | No | No |
| Smile + cheese | No | No | No | No | Yes | No | No | Yes | Yes |
| Smile + name | Yes | Yes | No | No | No | Yes | No | Yes | Yes |

Note. A "yes" indicates that the participant looked and smiled towards the camera, and a "no" indicates that the participant did not look and smile.

Table 3

*Caregiver Photo-Ranking of Pictures Taken during Study in Order from Least to Most Preferred*

| Sarah | Philip | Maggie |
|---|---|---|
| 15-S | 1 | 11-S |
| 2 | 2 | 1 |
| 1 | 34 | 8-L |
| 30 | 18-S | 2 |
| 72 | 7 | 30 |
| 7 | 8-S | 16-S |
| 43 | 55 | 52 |
| 8-L | 27 | 7 |
| 8-S | 16-S | 17-S |
| 23-S | 42 | 57 |
| 19-L | 36 | 59 |
| 17-S | 25-S | 60 |
| 28-S | 58 | 56 |
| 25-S | 59 | 61 |
| 49 | 41 | 28-S |
| 41 | 39 | 43 |
| 51 | 37 | 37 |
| 10-L | 54 | 48 |
| 12-L | | 40 |
| 74 | | 42 |
| 66 | | 9-S |
| 65 | | 9-L |
| 70 | | 46 |
| | | 54 |
| | | 36 |
| | | 8-S |
| | | 45 |
| | | 51 |
| | | 58 |
| | | 55 |

Note. The numbers assigned to each photo represents the session number. Sessions from smile training are indicated with “-S” and sessions from look training is indicated with “-L.”

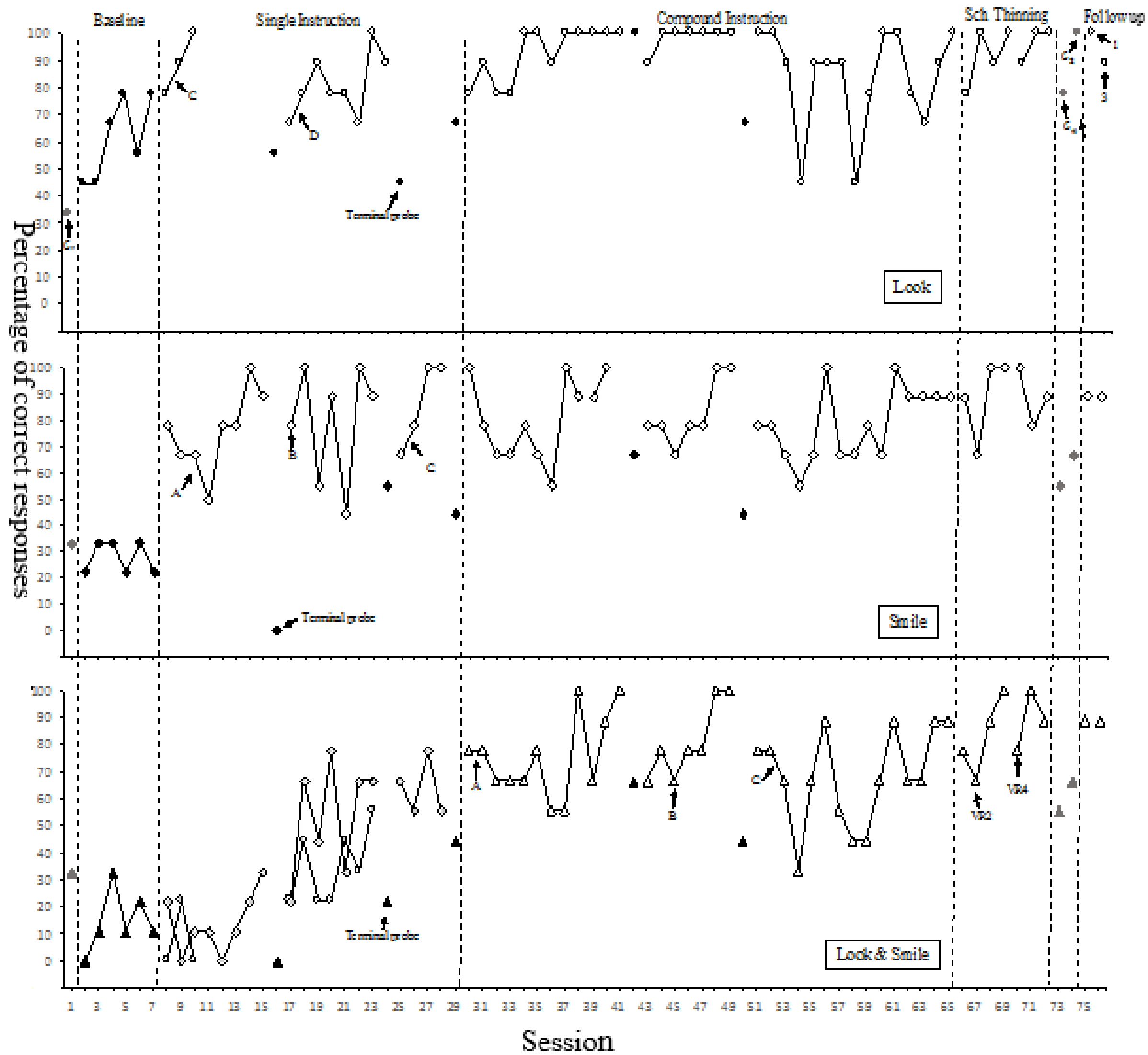



*Figure 1*. Sarah. The percentage of trials that Sarah looked, smiled, and simultaneously looked and smiled while having her photo taken. Circles represent looking, diamonds representing smiling, and triangles represent simultaneously engaging in both responses. Shapes that are grey represent generalization assessments, shapes that are black represent baseline and terminal response probes, and shapes that are white represent training phases.

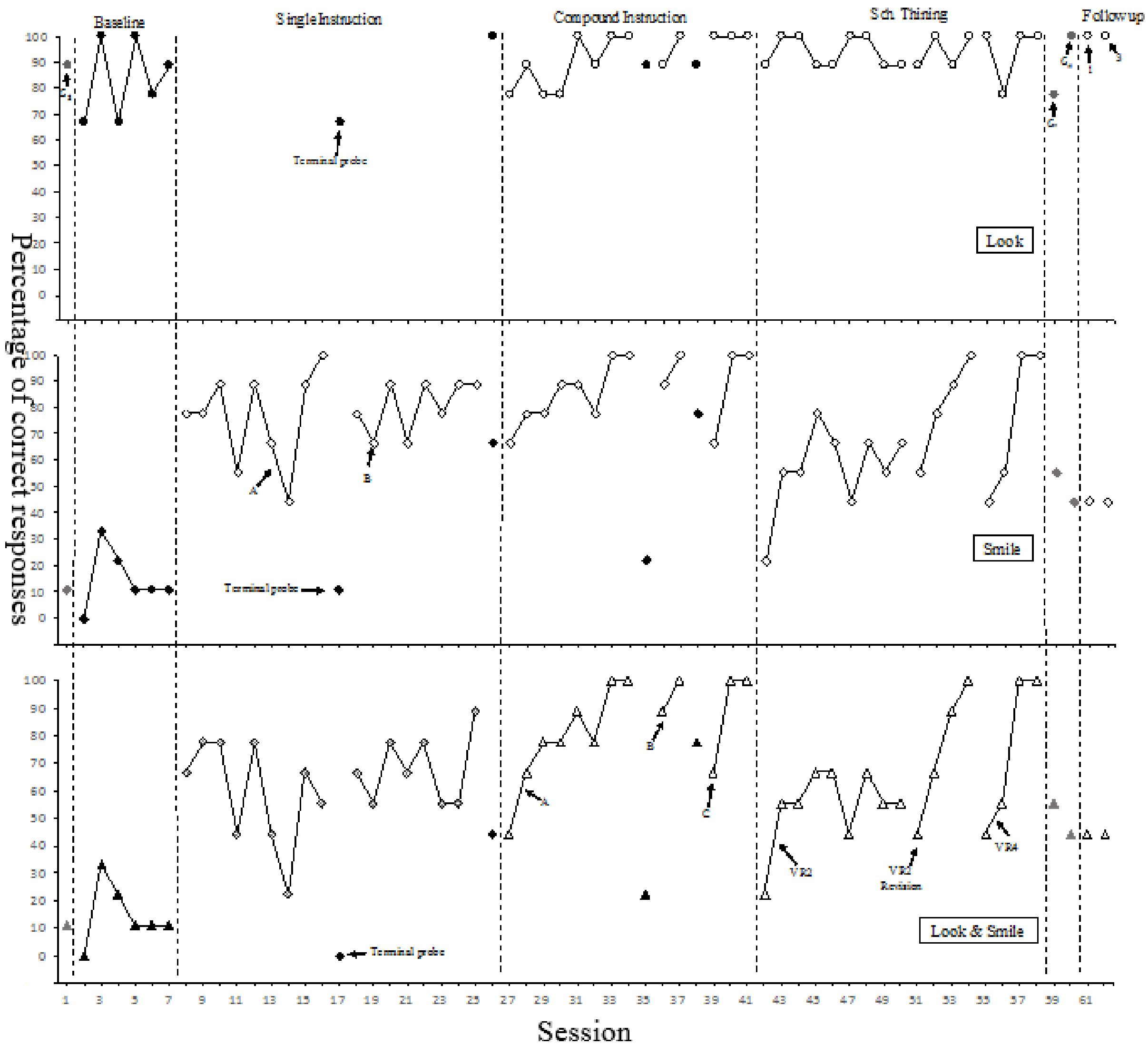



*Figure 2*. Philip. The percentage of trials that Philip looked, smiled, and simultaneously looked and smiled while having her photo taken. Circles represent looking, diamonds representing smiling, and triangles represent simultaneously engaging in both responses. Shapes that are grey represent generalization assessments, shapes that are black represent baseline and terminal response probes, and shapes that are white represent training phases.

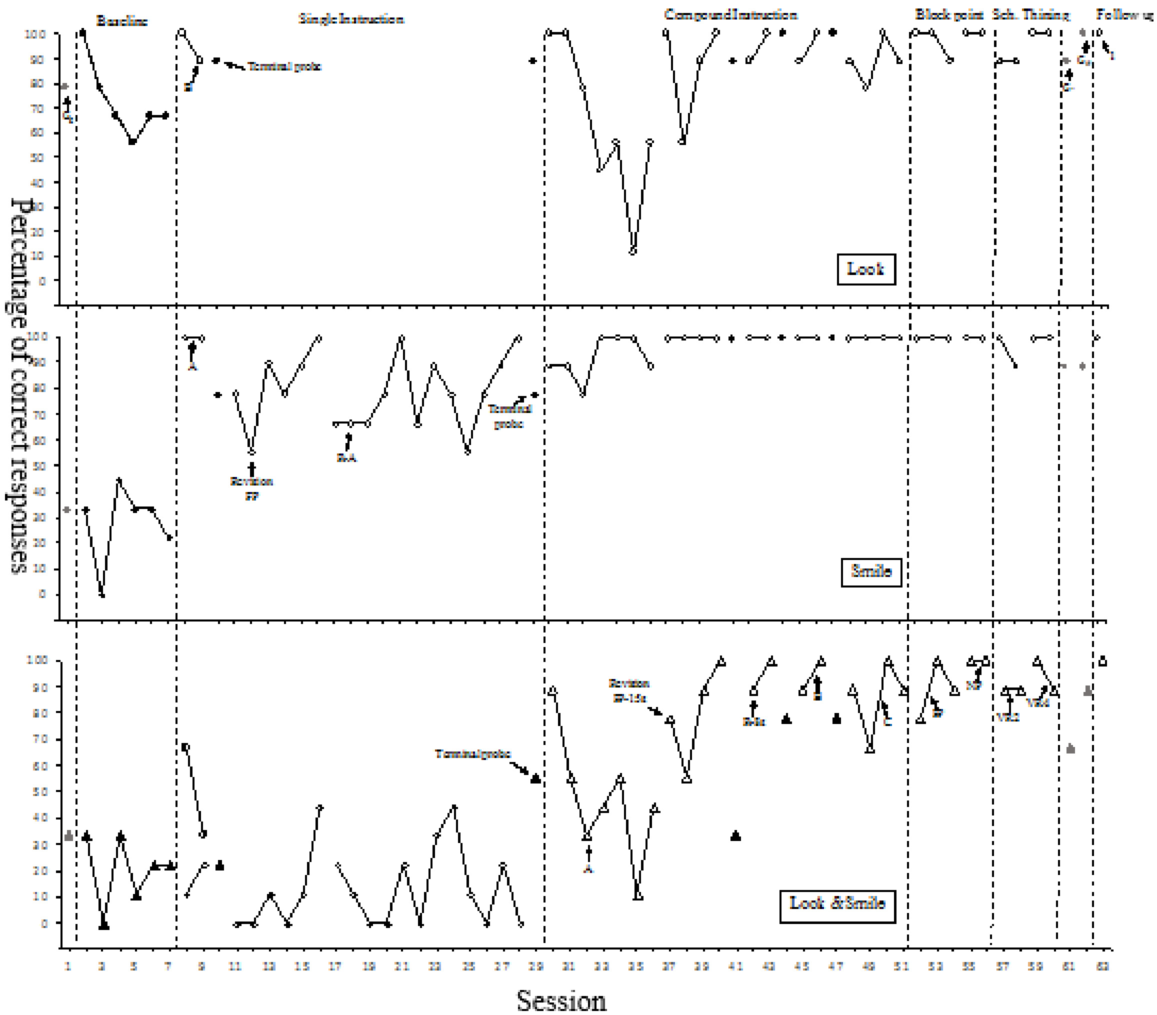



*Figure 3*. Maggie. The percentage of trials that Maggie looked, smiled, and simultaneously looked and smiled while having her photo taken. Circles represent looking, diamonds representing smiling, and triangles represent simultaneously engaging in both responses. Shapes that are grey represent generalization assessments, shapes that are black represent baseline and terminal response probes, and shapes that are white represent training phases.