Teaching a Child to Tact Emotions and Evaluating In Situ Generalization

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Teaching a Child to Tact Emotions and Evaluating In Situ Generalization

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Applied Behavior Analysis
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ABSTRACT

Children with autism can be disadvantaged socially by their difficulty recognizing emotions in others. This purpose of this study was to teach a 6-year-old child with ASD and emotion recognition deficits how to recognize the emotions of others via photos of facial expressions. A multiple baseline across emotions design was used. Photos of a variety of people were used to promote generalization and prompting, positive reinforcement, and error-correction procedures were implemented. The study effectively taught the participant to identify emotions based on photos of faces. The study also evaluated if learning to tact emotions via photos would generalize to in situ. The in-situ probes revealed that the skill did not generalize to correctly tacting the emotions of a volunteer based on facial expression in situ. In-situ training or discrimination training may be needed to promote generalization of this skill to the natural environment.
CHAPTER ONE: INTRODUCTION

Individuals with autism spectrum disorder (ASD) are significantly more likely to have severe impairments in the ability to identify and describe feelings than the general population, (Hill et al., 2004). In fact, impairments in social-emotional reciprocity are part of the diagnostic criteria for ASD (Reynolds & Kamphaus, 2013). These deficits can be detrimental to their well-being because having difficulty identifying and describing feelings is associated with higher rates of depression (Honkalampi et al., 2000). Children with ASD may have trouble understanding their emotional states as well the emotional states of others (Baron-Cohen et al., 1985). Their struggle to understand the perspectives and private events of others may be connected to their difficulty in engaging in appropriate social behavior such as turn taking, sharing, and showing empathy (LeBlanc et al., 2003). For example, a study comparing children with Attention Deficit Hyperactive Disorder (ADHD) and Oppositional Defiance Disorder (ODD) to children with ASD found that children with ASD exhibited the lowest ability to recognize emotions based on pictures of faces (Downs & Smith, 2004).

Emotional communication, such as giving and receiving information about one’s emotional state through facial expressions or other avenues, is important in the formation of social relationships (Halberstadt et al., 2001). Emotions provide information during social interactions that imbue meaning to them (Halberstadt et al., 2001). For example, a child on the playground may see another child with furrowed eyebrows and lips curled down indicating an angry expression. If the child can correctly identify that emotion as anger, then via operant conditioning they may know that the child likely does not want to play and that an angry face is an S-delta for initiating play. Skills in understanding one’s own emotions and recognizing the emotions of others play an important role in developing social and emotional competence.
Skinner discussed how facial expressions are a way to express emotions to the external world in his book Verbal Behavior (1957). One approach to improve the lives of those with ASD is to develop and investigate interventions that teach how to identify others’ emotions.

Emotions in general pose a challenge to children with ASD, but more complex emotions such as jealousy, pride, surprise, embarrassment, or shame may be even harder to understand, possibly due to undeveloped theory of mind skills (Bauminger, 2004; Begeer et al., 2008). A child falling, getting hurt, and feeling sad is more straightforward than a child falling and feeling embarrassed, because the latter requires one to conceptualize what those around them are thinking (Begeer et al., 2008). The ability to visualize the mental states of others may be a prerequisite to understanding some emotions (Beeger et al., 2008).

The development of emotion recognition in people with ASD differs from typically developing individuals (Rump et al., 2009). One study compared groups containing people with ASD to control groups and separated them by ages 5 – 7 years old, 8 – 12 years old, 13 – 17 years old, and 18 + years old. Participants were shown videos of facial expressions, a primary way people recognize emotions, at varying degrees of subtlety. In the typically developing control groups they found that the adults performed better than the children. This was not the case for the individuals with ASD who performed similarly regardless of age. This suggests that exposure across one’s lifetime helps typically developing adults learn how to recognize emotions, but some adults with ASD do not acquire this skill via the naturally occurring contingencies. The subtlety of emotions played a large role in whether the people with ASD could recognize the emotion. For example, participants with ASD, on average, could only recognize emotions like angry and afraid on the stimuli making the most exaggerated facial
expressions. The time that a face was displayed also had an impact on people with ASD’s ability to identify emotions (Rump et al., 2009). This information about the potential developmental differences between those with ASD and typically developing individuals can empower clinicians to make contextually appropriate interventions. For example, if an older client with ASD would need less help learning to recognizing emotions would not be appropriate based on the evidence. An explicit training program to help the client recognize more subtle emotions could potentially lead to them accessing social reinforcers in their environment.

**Theory of Mind**

Children with ASD have deficits pertaining to the “Theory of Mind.” The Theory of Mind (ToM) is the ability to recognize and understand the mental and emotional states of others. A study by Baren-Cohen et al. (1985) conducted an experiment with typically developing children, children with Down syndrome, and children with ASD. In the experiment, a doll had a marble that was moved to a new location when the doll left the room. When asked where the doll would look for the marble, the majority of typically developing children and those with Down syndrome correctly said that the doll would look where the marble was initially left. On the other hand, children with ASD did not answer the same way and thought the doll would look for the marble at its new location. This suggests that some people with ASD may have difficulties correctly understanding the beliefs of others and may be at a disadvantage when it comes to predicting others’ behaviors or taking their perspectives (Baren-Cohen et al., 1985).
Teaching Children with ASD to Identify Emotions

There are a variety of interventions that have been used to teach children with ASD to recognize emotions. The following section explains some of this research.

**Pictures**

Conallen and Reed (2016) used drawings of a boy’s face representing happy, sad, and angry to teach tacts based on facial expressions. A match to sample procedure was then used to have the participants match the facial expression to the appropriate situation card. Generalization was conducted with novel situation cards. The study found that the participants could be taught to identify the emotions of others and their matching skills did generalize to the novel situation cards. A generalization test to real life settings was not conducted (Conallen & Reed, 2016).

A study by Ryan and Charragáin, (2010) used multiple photos to teach emotion recognition based on facial expressions to children with autism. Specific components were highlighted such as a mouth forming an O during surprised and raised eyebrows. Once the components were reviewed, the participants had opportunities to select photos that represented that emotion. Other parts of this intervention included roleplays, matching games, and drawing faces. An emotion recognition test was used which showed pictures and 6 possible answers: happy, sad, angry disgusted, scared, and surprised. The results of the study indicated that the training group’s scores on the test improved significantly compared to the control group (Ryan & Charragáin, 2010).
Videos

Videos of novel situations have been effectively used to teach children with ASD to tact emotions. McHugh et al. (2010) used a multiple baseline across emotions design and taught three boys with ASD how to tact the emotions happy, sad, angry, and afraid using multiple exemplars to help generalize the skill to a variety of circumstances. The intervention package included discrete trial training, error correction procedures, echoic prompting, and reinforcement. The study evaluated the effect of the intervention using novel video scenarios and found that the skills did generalize to situations in which other people were present, or when the boys were in different environments. One limitation to this study is that the intervention and results evaluated tacting based on videos which may not translate to tacting emotions in vivo (McHugh et al., 2010).

Another study by Akmanoglu (2015) used video modeling to teach emotion tacting to participants with ASD. The study used a variety of materials to provide context in the videos, for example, a person opening a gift and portraying a happy expression. This study assessed generalization with novel individuals and stimuli in the video format. The intervention was effective in teaching the children to tact emotions based on the facial expressions and the skill generalized to other video situations with novel people and stimuli. Social validity assessments were conducted which found the participants teachers and caregivers had a positive view of the study, but an in vivo generalization test was not conducted (Akmanoglu, 2015)

Computer-Based Programs

A computer-based intervention was implemented to teach adults and adolescents with “high-functioning” ASD how to tact emotions based on photos (Bölte et al., 2002). The study
included 10 individuals who were placed in either a treatment or a control group. The treatment consisted of a 5-week training lasting for about 2 hr a week. Around 1,000 photos of people’s facial features and eyes were used to teach the following expressions indicative of emotions: happiness, sadness, anger, disgust, fear, surprise, and as a control a neutral expression. The computer program gave visual and acoustic feedback to the participant. It provided a smiley face icon and sound for a correct answer and corrective feedback, an explanation, and a comic strip example for incorrect answers. The results of the study found a significant improvement in those who underwent the training compared to the control. An interesting finding of the study was that participants started imitating facial expressions and providing feedback to the researchers on changes that could be made to the program. Another notable feature was that the authors tried to increase contextual fit by choosing the emotions taught based on a cross-cultural concept of emotions. Photos of both male and female faces from a variety of different cultures were used in the program. However, generalization to the in-situ environment was not assessed (Bölte et al., 2002).

Researchers have evaluated the effectiveness of the computer program *Mind Reading* which includes 24 emotion categories to help not just with the basic emotions, but more complex emotions as well (Golan & Baron-Cohen, 2006). The program even had a section teaching how to identify masked or insincere emotional expressions. Additionally, a variety of formats and models were used with the goal of increasing generalizability. The program utilized photos, video clips, audio clips, and brief stories containing actors who are male and female, young and old, and of varying ethnicities. Choice was also emphasized in this program, as participants had the option to build their own lessons and quizzes. Treatment lasted 10 weeks for approximately 2 hr each week and a control group was also utilized (Golan & Baron-Cohen, 2006).
Generalizability

An important factor to consider when assessing research about emotion recognition is not only the internal validity of the interventions, but also the external validity (Berggren et al., 2017). For a study to have strong external validity it must be investigated if the results of a study can apply to other settings, populations, and situations, or if the outcomes were unique to the participants of the study. For example, if a child learns to identify emotions using a computer-based system then it would be important to learn if this skill will generalize to a naturalistic setting (Berggren et al., 2017). One study attempted to determine the generalizability of results from randomized control trials based on factors like setting, situation, population, intervention delivery and format. This article reviewed 13 studies based on teaching children with ASD emotion recognition using Theory of Mind programs. Some of the studies examined used computer games. For example, Beaumont and Sarnoff (2008) taught participants to recognize emotion based on facial expression and body language. Others used videos, such as the Golan et al. (2009) study which used videos of vehicles with faces on them to teach emotions based on facial expression and match them to different situations. Computer and video formats were the most used formats of the 13 studies analyzed. The findings of this article were that real-world evaluations were rarely used in studies and there were insufficient follow-up assessments. The discussion brought up that emotion recognition should serve some purpose for the participant and their family such as increasing social skills, and assessments are needed to determine if this is indeed happening. Shared decision making between clinicians, clients, and families is emphasized as a potential solution to picking a suitable intervention and identifying goals (Berggren et al., 2017).
A notable example of examination of tact generalization from photos to in situ, is the article by Schebell et al. (2017) which focused on tacting actions. Schebell et al. compared photos to video training stimuli to determine which generalized better. Mandel et al, (2021) also examined the effects of the type of stimuli used to teach tacting actions on generalization. Nevertheless, this has not been a focus of emotion tacting; this research helps bring awareness to the importance of assessing social validity and generalizability.

Therefore, the purpose of this study is to teach emotion identification based on photos of facial expressions and to assess if this skill generalizes to an in-situ environment. Facial expressions are a commonly used way that people recognize the emotional states of others which is a skill theorized to be important in social competence. It is necessary to evaluate if learning to identify emotions via explicit training with a two-dimensional stimulus such as a photo will generalize to being able to recognize the emotions of an actual person and therefore potentially enable the individual to contact more social reinforcement in the natural environment. If these skills do not generalize in the in-situ assessment, then in-situ training may be needed to help individuals acquire this skill. The purpose of this study is to teach children to tact photos of facial expressions and to assess generalization within the natural environment.
CHAPTER TWO: METHOD

Participant, Screening, and Setting

The participant was a 6-year-old boy who was receiving behavior analytic services in a clinic setting 5 days a week for 3.5 hr per day. He was diagnosed with ASD. The participant had the pre-requisite skills of tacting and knew a variety of tacts related to common objects, animals, colors, and numbers. As per his behavior analyst, recently acquired tacts included: cat, fork, spoon, pants, and shirt. He had prior experience with discrete trial training (DTT) and could sit and attend to the stimuli for several minutes. The participant could communicate vocally.

Benefits of the study such as potentially learning to identify emotions based on facial expressions were discussed with his mother. Recommendations for learning other emotions may be given to his mother and BCBA after the completion of the study. The criterion for participating was scoring less than 3/6 on six trials of identifying at least one emotion via photo during baseline for any emotion. An explanation of risks and benefits was provided to the participant’s guardian(s) before receiving written consent. The study was approved by the Institutional Review Board (IRB.)

Sessions were conducted in a quiet room in the participant’s clinic. Which room was available varied each day, so the participant received training in a several different rooms over the course of the study, which may aid in generalization of learned skill. The rooms at a minimum had one table, two chairs, the participants bin with instructional materials and reinforcers, books, and toys.

Materials/Emotions

The participant was taught to identify three emotions that they could not independently identify at baseline. The emotions that were tested at baseline were happiness, sadness, anger,
surprise, and disgust. These emotions were chosen because evidence supports that the facial expressions that portray these emotions are consistent across cultures (Ekman, 1971). Six photos were taken by the researcher for each of the five potential target emotions (i.e., happy, angry, sad, surprise, disgust). A total of 30 photos were created. Models for the photos were chosen in an attempt to represent facial expressions made by people who are different in ages, ethnicities, cultures, and genders. The logic for materials creation was to increase the likelihood that generalization outside of the training set will occur through multiple exemplar training (Stokes & Baer, 1977). Some individuals were used to portray multiple emotions, such as sad and angry, while other individuals only portrayed one emotion, such as only angry. Photos of faces were scored independently by three volunteers to determine what emotion they portrayed. Multiple choice answers were provided to the volunteers with the emotions listed above or “None of the above” as their options; volunteers could only choose one answer. Only pictures which had 100% or higher interobserver agreement were used in the training procedure. In addition to the emotion pictures, a set of distractor pictures were included in the intervention sessions. These pictures were of previously mastered tacts: cat, crayon, fish, shirt, brush, and fork.

**Data Collection**

We evaluated the acquisition of emotion tacting by calculating the percentage of trials with correct responding. An independent correct response was defined as the participant engaging in a vocalization that matched the emotion depicted in the photo or on the face of the volunteer. During prompt fading, a response was scored as independent correct if the correct vocalization was made before the delayed prompt was delivered by the instructor. A prompted correct response was defined as the participant engaging in the target response after the instructor
delivered the verbal prompt. These prompted correct responses and incorrect responses (consisting of any vocalization that did not match the emotion being portrayed) were counted as incorrect for data. Independent correct responses were calculated by dividing the number of responses correct by the number of correct responses possible. Only independent correct responses were graphed.

**Interobserver Agreement (IOA)**

Videos were taken for baseline, tact training of emotions, and in-situ probes. An independent observer randomly selected 29% of sessions and collected IOA data on participant’s responses. The data taken by the second observer were then compared to the data collected by the researcher for IOA calculation. The equation that was used to calculate the IOA is 

\[
\text{IOA} = \left( \frac{\text{Agreement}}{\text{Agreement} + \text{Disagreement}} \right) \times 100
\]

There were 24 sessions scored and the interobserver agreement was 99% (range 83% – 100%).

**Procedural Integrity/Facial Expression Fidelity**

An independent observer used a checklist to evaluate procedural integrity during baseline and intervention. The checklist used can be found in Appendix B. Procedural integrity was scored for 25% of tact trainings and baselines with photos. The average treatment fidelity was 96% (range 82% - 100%). Additionally, a separate checklist (see Appendix C) was used to evaluate the fidelity of instructor and model behavior during in-situ probes. Procedural integrity for in-situ probe as evaluated for 100% of the trials and the average score for treatment fidelity was 89% (range 67% -100%). This was due to an omission error for two trials where the video ended before the instructor’s neutral response could be heard. Treatment fidelity forms can be found in Appendix B and C. The equation that was used to calculate the procedural fidelity was:

\[
\text{Procedural Fidelity} = \left( \frac{\text{Steps with Agreement}}{\text{Total Number of Steps}} \times 100 \right) = \% \text{ of Agreement}
\]
A volunteer was shown all videos of the in-situ probes to assess if the emotion the participant tacted was consistent with the facial expression the volunteer was making using a blind rating. Videos which do not pass the blind rating will not have their data used. This was to ensure that the facial expression accurately portrays the desired emotion. All videos passed the blind rating. The form can be found in Appendix C.

**Experimental Design**

The effects of training on emotion tacting were evaluated in multiple ways. First, we conducted a pre-test (the first three sessions of baseline) in which all 30 photos (6 each of three emotions = 18, plus 6 each of two untargeted emotions = 12) were presented. Second, a multiple baseline design across emotions was used during tact training, in which, following baseline, Tact Training Intervention was sequentially introduced across three baselines, one for each of the emotions: happy, sad, and angry. Baseline data were collected for all three emotions and intervention for a new emotion was introduced only when the previous panel reached relative stability and low variability. The training condition, Tact Training with Photos, consisted of reinforcement: praise and a check mark (paired with the word “check”) which corresponded to 20-s for each check with his highly preferred reinforcer (YouTube videos or sensory gym) which were delivered following sessions. An error correction procedure was also used (described below). The photo sets were interspersed with the distractor photos because the participant did not have any mastered emotion tacts and we wanted to ensure that he attended to each photo presented and did not learn to simply say the currently targeted emotion upon each photo presentation.
Procedures

Preference Assessment

Before the start of the screening assessment, a multiple stimulus without replacement preference assessment was conducted to identify a potential reinforcer. This procedure involved putting four items in front of the participant, saying “Pick one” and letting him choose. This item was not put back in the array and it was scored. The remaining items were re-arranged, and the participant was prompted to pick another one. This continued until the participant did not choose an item for 30 s or manded to leave (DeLeon & Iwata, 1996). The item that scored highest on the preference assessment was used as a reinforcer during the study. The instructor determined based on the results of the preference assessment found that YouTube videos on the phone was the most preferred item and there was no responding for the remaining stimuli which were two games and a book. During the preference assessment the phone was laying in the array with the other stimuli with the YouTube screen open. At the start of each session, the participant was also asked what he wanted to work for throughout the study because he has a strong manding repertoire, and because there was only one reinforcer identified during the preference assessment. Previous research has shown that reinforcer variability can better maintain responding over time (Keyl-Austin, Samaha, Bloom, & Boyle, 2012) For example, the instructor would ask him what he wanted to work for and he would verbally ask for “phone,’ ‘gym’ or other preferred items/activities.

In-Situ Probes

The in-situ probes explored whether identifying emotions from seeing photos of faces generalized to identifying emotions based on seeing a person’s face in situ. At least one in-situ probe was conducted for the training targets during each phase of the study: baseline and tact
training with photos A volunteer made a face corresponding to happy, sad, or angry. The instructor asked, “How is she feeling” and provided a neutral response once the participant responded. A video was taken during the probe of the volunteer to assess if the face they made clearly represented the correct emotion. Only data from videos which were validated by the rater were used, however all videos were validated, and none were required to be dropped. The training target probes were assessed in a quasi-randomized order.

**Baseline**

The participant was shown six pictures representing each of the five emotions (30 trials in a session). The pictures were presented to the participant at eye level one at a time in a quasi-randomized order. The randomization rule was to ensure the same emotion was not repeated more than three times in a row. It was randomized by first putting the emotions in separate piles for each emotion and counting them to ensure all six photos were present for each emotion. Following this, photos were grabbed randomly and put in a pile and then the stack was checked to ensure the randomization rule was followed. After presenting a picture, the instructor asked the participant “How is he/she feeling?” and waited for the participant to respond. Regardless of the participant’s response, the instructor provided a neutral response (i.e., “Thanks for telling me”).

The participant performed at 0% for all emotions across baseline so the instructor discussed with the participant’s mother to choose the three emotions she wanted to be trained. The three emotions chosen were happy, sad, and angry. Because the participant received a 0% correct for all emotions during baseline, all non-target emotions were removed and additional acquired pictures were used as distractors. These included a photo of a cat, crayon, fish, shirt, brush, and fork.
Training Procedures

Tact Training with Photos

A multiple baseline across emotions design was conducted and the participant was taught to identify three emotions. Happy, sad, and angry were trained on separately and intervention was staggered for each emotion. The baseline, probe, and intervention data for each emotion was put on its own graphs (i.e.) all happy baseline, happy probe, and happy intervention data on one graph. The criteria for moving on to teaching the next emotion was the participant getting three consecutive sessions of 5/6 correct. Happy was trained first until it met this criteria, next sad was taught, and finally angry was taught. The training program consisted of presenting the six pictures of the target emotion interspersed with six distractor pictures one at a time. A training emotion was presented on the first and last trial. Feedback was provided for correct and incorrect responding. Correct responses were reinforced with praise (e.g., “Great job, he is angry”) and a generalized conditioned reinforcer (check marks) that was clearly visible to the participant. These checkmarks counted as 20-s of time each which could be spent with a desired reinforcer. This meant that the more correct answers the participant made the longer they could spend interacting with a preferred item or activity such as YouTube. Incorrect responses resulted in error correction, (i.e., “Try again, happy”). Initially the emotion being trained (happy) was being intervened on in the same session as the baseline emotions of sad and angry, but they were separated into a different session to avoid inadvertently reinforcing incorrect baseline responses. This occurred on session seven which was the third session of intervention. The baseline emotions were not receiving any error correction or reinforcement, but the backup reinforcer received at the end for the correctly answering questions about the training emotion and distractor items could potentially unintentionally strengthen incorrect baseline responses.
A graduated prompt delay (Touchette & Howard, 1984) was used to teach the correct response by giving an immediate prompt, such as “How are they feeling: happy.” The instructor then delayed the time between the instruction and verbal prompt by 2 s at the start of each new session. Reinforcement was given contingent on correct prompted or independent answers. The instructor also responded to a correct response to the distractor trial with verbal praise such as “Awesome job that is a cat, check” and a checkmark. Error correction was also implemented for the distractor trial if an incorrect response was given. Responses were marked on the data sheet found in Appendix A. The amount of training sessions conducted in a day ranged from 2-22. The criteria to conduct in-situ probes for happy, sad, and angry was once every emotion reached 6/6 for a minimum of one photo tacting session.

Social Validity

A social validity questionnaire was provided to the participant’s mother. Because there was one participant the responses cannot be anonymous, so a paper form was given to them. It consisted of a Likert-like questionnaire and open-ended questions (Likert, 1932). The participants mother ranked each question a seven on the scale. She said that she was happy with her sons increased expression of emotions and did not have any criticisms or suggestions to improve the study. The social validity assessment with the questions that were asked can be found in Appendix D.
Figure 1. Results for Multiple Baseline Across Emotions showing Tacting Emotions based on Facial Expressions. Each panel depicts a different emotion. Happy is on the top panel, Sad is on the middle panel, and Angry is on the bottom panel. Sessions are along the x-axis and percentage of independent correct is along the y-axis. There are labels with the time of prompt delay used. The 0 s represents the session with immediate prompting. The asterisks represent the point where the baseline emotions were switched to being conducted in a separate sitting than the intervention emotion (happy).

The top panel is tacting happy. The participant scored 0% for all in-situ probes and photo stimuli at baseline. The trend for tacting happy based on photo stimuli increased once the
intervention was implemented and the participant reached trials to criterion (6/6 for three consecutive session) after 12 sessions of intervention. Data continued to be collected so the skill would be maintained as new emotions were taught. There was low to moderate variability in the sessions and a high level.

The middle panel is tacting sad. The participant scored 0% for all baseline probes and photos. Following a couple sessions of intervention, the trend for tacting sad based on photos also increased and there was low to moderate variability in the data.

The bottom panel of the graph is tacting angry. During baseline the photos and baseline probes were 0%. Tacting angry based on photos also showed an increasing trend following the implementation of intervention. The variability for angry was moderate to high. Once all emotions had reached 6/6 for a minimum of one trial in-situ probes were conducted to assess generalization. The participant scored 0% for all in-situ probes.
CHAPTER FOUR: DISCUSSION

The purpose of this study was to teach a child to tact emotions based on facial expressions using photos and assess if this skill generalizes to the in-situ environment. The results of the study indicate that the participant did acquire the ability to tact facial expressions using photos. The first emotion trained, happy, acquired mastery criterion in the least amount of time, which may be because it was the first emotion taught and it spent the least amount of time in baseline. Sad has not yet met mastery criterion, but it had a quickly increasing trend and low variability compared to angry which was trained last. More difficulty in acquiring angry may be due to the participant’s increased exposure to baseline, more possible responses that they have learned, sequence effects, or difficulty discriminating specifically between sad and angry. It appeared that at times the participant focused on the mouth of the stimuli rather than attending to the entire face. Psychological research on perception suggests that individuals with autism may focus more on component parts than holistic processing (Davies et al., 1994). A study by Langdell (1978) found that younger children with ASD tended to focus on the lower half of the face compared to other groups and that they scored better on pictures where just the bottom half of the face was showing compared to controls. If the participant was concentrating more on the bottom half of the face this could make sad and angry more difficult to discriminate than sad and happy because the lower half of sad and angry are more similar.

One limitation of the study was that the happy intervention was originally run in the same sitting as the sad and angry baseline (Sessions five and six on the graph). This looked like happy, distractor objects, sad, and angry pictures (total of 24 photos) being show in a quasi-randomized order in one sitting. It was done this way to promote discrimination between the training and baseline emotions, but researchers did not want the baseline answers to be inadvertently
reinforced by the participant receiving the backup reinforcer at the end of the session. The baseline emotions of angry and sad received neutral responses and no error correction. In order to avoid inadvertent reinforcement or slow acquisition of the target emotion the procedure was altered so that the training emotion (happy) was taught with only the distractor objects present. The baseline emotions of sad and angry were then run in a separate sitting. The participant still scored 0% for the baseline emotions indicating there was experimental control.

External generalization should be a primary goal of emotion tacting programs. Socially significant behavior change is a fundamental tenant of Applied Behavior Analysis (Wolf, 1978), so evaluation of the in-situ effects of programs such as emotion recognition can help us better understand which interventions clinicians should spend time doing to effectively teach their clients skills that will receive reinforcement in the natural environment. The low scores from the in-situ probes suggest that the skill did not generalize to the in-situ environment following the photo tact training for happy, sad, and angry. This may be due to more discrimination training being needed between happy, sad, and angry. It is also possible that it was due to the volunteer not being one of the people in the photos. This may have made it more difficult to generalize because the participant would need the skill to generalize to both a novel person and from a two-dimensional to three-dimensional facial expression. It is unclear whether the participant lacked the skill to generalize from two-dimensional to three-dimensional stimuli or the skill to generalize from person to person. The stimuli used for the photo training had photographs of individuals who were Asian, Hispanic, and white and the in-situ volunteer was African American. It is possible that more diversity of people of varying cultural backgrounds and ethnicities in the photos could have aided with the in-situ generalization. More research is needed to see what variable(s) impacted the skill not generalizing.
Future research could investigate if the skill will generalize from photos to in situ if the model in the photo is the same as the in-situ volunteer. It is possible that the participant did not have the pre-requisite skill to attend to a person’s face since during one of the probes he answered before looking at her face and it took gestural prompting to increase the participant attending to the volunteer’s face.

Another area of investigation is the materials used to teach emotions. Some of the models used in the photos were only seen in one emotion while other models were used for multiple emotions. Using the same model for multiple emotions may help increase discrimination so that the participant is not focusing on arbitrary features such as hair color. The materials used in training had one model who appeared in all three emotions, four who appeared in two emotions, and seven who appeared in one emotion.

It is also possible that the form of the stimuli used impacted the ability for the tacting to generalize to the in-situ probes. A study by Schebell et al. (2017) investigated how well tacting actions generalized to in vivo when comparing video and picture stimuli. The study found that generalization did occur when either photo or video stimuli were used for training and that idiosyncratic differences may account for which one is more efficient, generalizes better, and maintains better. Research regrading in-situ generalization for emotion tacting is limited so future research could assess what impact the type of stimuli has on generalization.

Mandel et al. (2021) was an extension of the previous research which compared video, picture, and in vivo stimuli for teaching tacting of actions. They found that teaching tacting of actions with an in vivo stimulus was the most efficient and resulted in better generalization and maintenance. A few possible reasons for the increased generalization and efficacy were that there are slight differences in the model which may have increased attending, such as a hairstyle. This
could be applicable to tactual emotions as well, for example, in vivo models may smile slightly differently each time they portray happy. Another possible factor Madel et al. discussed was that participants have experience seeing people engage in actions, similarly, participants would likely have experience seeing people make facial expressions. Emotions, however, may be easier to identify in a static frame (such as a picture) than actions are. Future research should be conducted to see if the findings of Mandel et al. can be replicated with tactual other less salient overt behaviors such as emotions.

This study examined a variety of procedures to train emotion tactual based on facial expressions in a child with ASD, and whether or not emotion tactual generalized to in situ settings following training. Although data collection is still underway, we have demonstrated experimental control over the acquisition of three emotion tacts using photos. Depending on the point at which in situ generalization occurs, recommendations will be made regarding the approaches to training emotion tacts to result in in situ generalization in future research and clinical applications.
REFERENCES


Appendix A: Data Collection Sheet

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<th>Date: ____________</th>
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Appendix B: Treatment Fidelity Sheet Tact Training with Photos

Rater:  

Video Title: ______________________

Treatment Fidelity Sheet Tact Training with Photo

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<th>Participant Response</th>
<th>Correct Consequence Delivered</th>
<th>Correct Error Correction (if applicable)</th>
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Correct/Total Possible: / %
Appendix C: In-Situ Treatment Fidelity, Facial Expression Fidelity, IOA Sheet

Procedural Integrity Check – IN SITU
Rater:  
Date: 

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<th>Video #</th>
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Appendix D: Social Validity Assessment

The Likert-like scale will be ranked from 1-7 with 1=Strongly Disagree, 2=Disagree, 3=Somewhat Disagree 4=Neither Agree nor Disagree, 5=Somewhat Agree, 6=Agree 7=Strongly Agree.

On a scale of 1-7:

1) This program helped (participant’s name) to recognize how others are feeling.

2) This program improved (participant’s name)’s social skills.

3) I am glad my son/daughter participated in this program

4) I think learning to identify emotions is important

5) I think this program will increase (participant’s name)’s quality of life.

Open ended:

What did you like about this program?

______________________________________________________________________________

______________________________________________________________________________

What could be improved?

______________________________________________________________________________

______________________________________________________________________________

Additional Comments:

______________________________________________________________________________