RESEARCH ARTICLE

Using Multiple Exemplar Training to Teach Empathy Skills to Children with Autism

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Abstract The purpose of the study was to use multiple exemplar training to teach empathetic responding to two children with autism. Three emotions—happiness, frustration and sadness/pain—were chosen for this purpose. Treatment consisted of verbal prompting and reinforcement of empathetic responses. Four experimenter-defined categories with discriminative stimuli were used for each emotion. The multiple exemplar component of the model consisted of teaching responses in the presence of several discriminative stimuli drawn from the predefined categories for each emotion delivered by two persons across two environments. Results were evaluated using a multiple baseline design across behaviours and indicate a systematic increase in responses with the introduction of treatment across each category for both participants. Generalization of responses from training to non-training stimuli in both participants was observed during probe trials and was maintained during follow-up probes.

Keywords Autism · Empathy · Multiple exemplar training · Generalization

Introduction

The *Diagnostic and Statistical Manual of mental disorders (DSM–V)* defines a deficit in socio-emotional reciprocity including reduced sharing of interest, emotions or affections as

one of the diagnostic criteria for autism spectrum disorder (ASD). Although empathy deficits in individuals with autism have been well documented (Rutter, 1978; Baron-Cohen, Leslie, & Frith, 1985), the definitions of empathy have varied considerably across research laboratories. The term “empathy” can refer to an ability to adopt another’s perspective (Sigman, Kasari, Kwon, & Yirmiya, 1992; de Waal, 2008) and experience a congruent emotional state (Yirmiya, Sigman, Kasari, & Mundy, 1992). Researchers have suggested that empathic distress, or experiencing concern for others, plays an important role in the development of prosocial behaviours such as helping and sharing in young children (Eisenberg, McCreath, & Ahn, 1988; Williams, O’Driscoll, & Moore, 2014; Zahn-Waxler & Radke-Yarrow, 1990).

Being able to respond appropriately when someone is sad or frustrated forms an integral part of peer engagement and play among children. Empathetic responding plays a role in increased interactions with classmates and is likely to be maintained in the natural environment by the development of friendships and other social relationships (Charlop & Walsh, 1986; Rheingold & Hay, 1980). Access to such interaction and play is of significance to children with autism during the transition to general education classrooms. This makes empathy an important area of research among other social behaviours.

Some researchers approach deficits in empathy as an inability to adopt another person’s perspective (Baron-Cohen et al., 1985; Yirmiya et al., 1992). Empathy deficits were viewed as occurring due to attention deficits by Sigman et al. (1992), who also demonstrated that children with autism failed to attend to the affect of an adult displaying a negative emotion in contrast to normally developing or mentally retarded children which contributed to their social deficiencies.

Recent research has approached deficits in social behaviour as a stimulus control problem, suggesting that behavioural deficits could be due to stimulus over-selectivity—

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responding to only one or to a reduced number of components when faced with a stimulus (Bailey, 1981, Lovaas, Koegel, & Schreibman, 1979). Although a number of researchers have recorded empathy deficits in children with autism, very few studies have focused on the strategies to overcome this problem and documented the extent of generalization of the skills acquired.

Gena, Krantz, McClannahan and Poulson (1996) taught contextually appropriate affective responding to four individuals with autism using modelling, prompting and reinforcement in various scenarios such as showing appreciation or sympathy. There was an increase in appropriate responding across all participants and generalization occurred to untrained scenarios, therapists and settings. Harris, Handleman and Alessandri (1990) taught three adolescent boys with autism to offer assistance to a person unable to complete a simple task. All three participants showed rapid acquisition of helping responses during treatment and some transfer of skills to novel settings and tasks. Both these studies addressed deficits in social behaviour using operant techniques such as reinforcement and prompting, and the results have implications in the present study.

Schrandt, Townsend and Poulson (2009) used vignettes with dolls and puppets demonstrating various types of affect to teach empathetic responding to four children with autism. Although increases in appropriate responding were observed during treatment, the responses generalized from dolls to actual people in a non-training setting for only two of the participants. Deficits in empathy were viewed as occurring due to an inability to differentiate the situations in which specific responses were appropriate. The results of these studies on empathy (and social behaviour) indicate that acquisition and generalization of responses to non-training stimuli likely occurred due to training with multiple exemplars (e.g. showing a variety of situations where help is to be provided) within a stimulus class.

Previous research conducted in training empathy responses has shown the successful use of a variety of discriminative stimulus compounds to evoke empathy responses. Schrandt et al. (2009) used a combination of vocal and motor stimuli to teach empathy responses. One major limitation of this is that affective stimuli, which likely form an important part of the discriminative stimuli that evoke empathy in the natural environment, were not programmed to be part of the antecedent. Gena et al. (1996) used scenarios each involving a vocal and affective stimulus, but not motor stimuli, to teach empathetic responding.

In the natural environment, the discriminative stimuli that evoke empathy responses are quite complex and likely involve combinations of vocal, motor and affective stimuli. Our identification of the relevant discriminative stimuli and programming these during treatment play a role in the generalization of acquired skills beyond training conditions (Stokes

& Baer, 1977). As a preliminary attempt to operationalize the stimulus compounds and represent the diversity of stimuli present in the natural environment, the present study used verbal, motor and affective discriminative stimuli in each scenario used for training. This combination of stimuli has been used successfully in the training of prosocial behaviours such as helping and sharing (Reeve, Reeve, Townsend, & Poulson, 2007; Marzullo-Kerth et al., 2011). The present study sought to examine the effectiveness of this discriminative stimulus compound in teaching empathetic responding.

To promote generalization, empathy responses were taught in two different settings using two different persons as discriminative stimuli during training. The treatment package consisted of multiple exemplar training, prompt delay and reinforcement to teach empathetic responding. The extent of maintenance of the acquired skills was assessed during a follow-up session conducted after the conclusion of the study.

Method

Participants

Two children with a diagnosis of autism spectrum disorder (ASD) participated in the study. They attended a private school and received their diagnosis prior to school enrolment. The diagnosis was done by an outside agency at the time of referral and was confirmed by a clinical psychologist using the criteria of DSM-V (American Psychiatric Association, 2013).

Antony was 5 years and 2 months old, and Paul was 5 years and 8 months old. They received 2 h a day of ABA instruction thrice a week. The remainder of their time was spent in a general education classroom with 25 typically developing peers. Both children had a teaching history with discrete trial as well as incidental teaching formats. They had the prerequisite vocal imitation skills to repeat four-word phrases modelled by the instructor. Prior to the study, the participants emitted little or no appropriate empathy towards others as indicated by the caregivers using a questionnaire. The questionnaire had five questions regarding the participant's responding in social situations involving a display of affect (ex. "Does your child offer comfort when you indicate pain?", "Does your child offer help when a peer is struggling with an activity?"). Each child, however, could comply with instructions to engage in familiar tasks, identify emotions when incidents were narrated and had acquired verbal skills to have short conversations and request for items, information, etc.

The identification of affect was directly assessed using picture cards of various facial expressions, pictures of people in various situations displaying affect and real people making several displays of affect (smile, laugh, frown, pout, looking down with a hand on the head, etc.). Additionally, specific

social incidents were narrated involving a person experiencing a certain emotion wherein the participants could identify the emotions correctly. All other verbal skills were assessed using the Assessment of Basic Language and Learning Skills (ABLLS-R; Partington & Sundberg, 1998).

Setting and Materials

Sessions were conducted in a small room that contained two chairs a table, two cabinets and a bookcase. Toys and materials needed for the training were stored in the cabinets. Datasheets and stationery were placed on the table. A digital video camera was placed in one corner of the room and was used to record some sessions. The second setting used for training and generalization was a large, open-air hall containing four high stools for storage and two chairs.

Materials used included puzzles, a set of marbles, colouring books, a bowling set, toy autos and cars, blocks, books, a battery case, bubbles, kaleidoscopes, a slinky, a guitar and a light and sound ball.

Emotion Categories, Response Measurement and Interobserver Agreement

The three emotion categories chosen were sadness or pain, happiness and frustration. Each emotion category had four

stimulus categories. In each stimulus category, five different events served as multiple exemplars. For example, in the frustration category, *searching for objects*, *difficulty fixing an object*, *dropping objects* and *carrying heavy objects* were the four stimulus categories. In the searching for object category, puzzle pieces, a board game, a bowling pin, a book and a crayon served as exemplars. The stimulus categories and exemplars were chosen following a 2-h informal observation session involving typically developing children as well as children diagnosed with ASD between 4 and 7 years of age, conducted in a school and at home (Reeve et al., 2007; Marzullo-Kerth et al., 2011).

For each exemplar, the instructor provided a non-verbal, a verbal and an affective discriminative stimulus. The non-verbal discriminative stimulus for all exemplars in the *searching* category involved the instructor looking for an object (hands contact an object inside a bag and move back and forth). The verbal discriminative stimulus consisted of an exclamation (“oh”, “uff”, “oops”) followed by a comment about the item (“I cannot find the puzzle”, “where did this crayon go”). The affective discriminative stimuli included shaking the head, a frown, a sigh, etc.

Empathy was operationally defined as a contextually appropriate response involving a vocal component (and a motor component, in the case of frustration) within 3 s of a display of affect by a person. For example, the participant was taught to

Table 1 Training and probe discriminative stimuli and empathy responses for frustration

Frustration	Non-verbal SD	Verbal SD	Affective SD	Empathy response
Fixing objects Bag Puzzle Auto Blocks	Hold an object (or a part of an object) in each hand	Uff /Argh/Oh man It is so hard to fix/close the box/bag/puzzle/-auto/blocks	Pout/frown/sigh	Child asks “Do you need help” or “May I help you” and fixes/closes the object
Searching for objects Puzzle Game Bowling Pin Story book Orange crayon	Insert a hand into a box/bag/cabinet, contact an object and move hand back and forth	Uff /Argh/Oh man I can’t find the puzzle piece/game/book/-bowling pin/orange crayon	Pout/frown/sigh	Child asks “Do you need help” or “May I help you” and then places hands inside a bag/cover/cabinet and locates the object
Carrying objects Plastic covers Bags Stack of board games Stack of books Boxes	Hold at least 5 objects in the palms of both hands	Uff /Argh/Oh man This is too heavy/There’s too many	Frown	Child asks “Do you need help” or “May I help you” and then extends an arm towards an object held in the instructor’s hands; and holds the object
Dropping objects Marbles Books Blocks Papers Batteries	Release object in hand and it contacts the floor	Uff /Argh/Oh man I dropped everything	Pout/frown/sigh	Child asks “Do you need help” or “May I help you” and then picks up at least two objects from the floor

say “May I help you?” and put his hand inside the bag to find the puzzle. Two different vocal responses were taught for each antecedent category (happiness, sadness, frustration).

To promote ease of generalization, the responses taught for a particular event in an antecedent emotion category were appropriate for all events within that category. Categories for happiness included *completing a task, locating an item, talking about a favourite event* and *presenting a new object*. For example, the instructor would point to a completed puzzle, smile and say “I finished the puzzle”. The empathy responses taught for all happiness exemplars were “Wow, so cool” or “That’s cool”. Categories for sadness/pain included *falling down, getting hurt while using an instrument, being ill* and *encountering broken items*. One of the discriminative stimuli in this category involved the instructor stubbing a toe against the wall, frowning and saying “Ow, that hurts”. The empathy responses taught for this category were “Are you alright?” or “Hey, are you okay?”. A list of stimulus categories, exemplars and responses used for the training and probe trials for each emotion is listed in Tables 1, 2 and 3.

The cultural variations in the topography of affective behaviour (Davitz, 1964) and the differences in interpersonal touch across cultures (Remland, Jones, & Brinkman, 1995) played a role in the experimenter’s choice of responses. Since both participants in the study were Asian children from typical households in India, where social interactions do not normally involve physical contact, appropriate responses to displays of happiness and sadness only involved a vocal component.

Additionally, other contextually appropriate responses were scored as correct even if they were not part of the training responses. For instance, saying “Can I look for it?”, “What happened?”, “Awesome”, “Cool” and “I can help you”, etc. was scored as correct even though these responses were not taught directly.

The experimenter and one other instructor measured inter-observer agreements for 30% of the sessions in each experimental condition for both participants. Observers recorded vocal responses (and motor responses for frustration trials) from videotapes of the sessions. For each trial, they circled “yes” if a contextually appropriate response occurred within 3 s of the display of affect. They circled “no” in all other situations. Agreements were defined as trials in which both observers circled the same response (yes or no). Disagreements occurred when the same response was circled differently by both observers. Interobserver agreement was calculated as a percentage obtained from the ratio of agreements divided by agreements plus disagreements. It was found that across both participants and experimental conditions, agreements ranged from 92 to 100% indicating no more than 1 disagreement per session.

Procedure

A trial began when the instructor presented an event with the programmed discriminative stimuli and ended after a designated interval of time (3 s) during baseline and probe trials.

Table 2 Training and probe discriminative stimuli and empathy responses for sadness

Sadness	Non-verbal SD	Verbal SD	Affective SD	Empathy response
Fall down Stub a toe against a table Hit elbow against the door Hit knee against a chair Fall to the ground while running Fall down while climbing stairs	Rub toe/elbow/knee/- arms/back	Uff/Argh/It hurts	Pout/frown	“Hey are you okay?”/“Are you alright?”
Sick/in pain Headache Stomach ache Neck pain Shoulder pain Coughing	Rubbing head/stomach/neck/- shoulder/chest	Ow/Ouch	Pout/frown	“Hey are you okay?”/“Are you alright?”
Hurt while using an instrument Paper scissors Hot toast Zipper Shoe buckle	Rub fingers	Ouch/Ow that hurt	Pout/frown	“Hey are you okay?”/“Are you alright?”
Sad about a broken item Board game Mr. Potato head Toy guitar Kaleidoscope Toy camera	Hold item between palms	Uff /Argh/Oh man It’s broken	Pout/frown	“Hey are you okay?”/“Are you alright?”

Table 3 Training and probe discriminative stimuli and empathy responses for happiness

Happiness	Non-verbal SD	Verbal SD	Affective SD	Empathy response
Completing/winning a task Puzzle Spinning top Tummy ache game Blocks	Holding the puzzle/picture/-collage/blocks using fingers; pointing to the spinning top/game and putting both hands up in the air	Yaay I finished/Yaay, I won!!	Smile/laugh	“That’s cool!”/“Wow, so cool”
Talking about a new item Board game Shoes Book Bag Kaleidoscope	Holding the board game/book/bag/-kaleidoscope between the fingers; pointing to the shoes worn on the feet	I bought a new game/shoes/book/-bag/kaleidoscope	Smile	“That’s cool!”/“Wow, so cool”
Locating an item Toy lizard Toy octopus Harmonica Ball Toy camera	Toy lizard/octopus/-harmonica/ball/-camera held between fingers	Hey I found it!/“Wooho, look I found a lizard/octopus/-harmonica/ball/-camera”	Smile	“That’s cool!”/“Wow, so cool”
Talking about an ongoing event Piano Slinky Water spray Rotating chair Scooter board	Fingers contact piano keys to produce sounds/fingers pull the ends of the slinky to stretch it/finger presses lever to release water from the spray/sit on the rotating chair and turn around/sit on the scooter board with feet on ground and propel forward	Wooho! This is so much fun	Smile/laugh	“That’s cool!”/“Wow, so cool”

The instructor provided prompts and delivered consequences during training trials. All sessions began with a preference assessment where the participants chose any two preferred items or activities from an array of ten items.

Baseline

During baseline, the experimenter provided the discriminative stimuli associated with each event programmed for the child (ex. saying “Ow that hurts” while stubbing toe against the table and frowning). The experimenter then waited 3 s for the child to emit the appropriate response. A conversational exchange (ex. “Thank you”, “okay”) followed correct responses. No feedback was provided for incorrect responses. No explicit instructions or prompts were provided during the trials. There were ten trials that were conducted every session during baseline. Throughout the session, the instructor delivered praise and preferred toys approximately once every two trials for appropriate sitting, waiting and attending to events presented.

All trials were conducted in a naturalistic fashion. Frustration and happiness trials were conducted during regular activities involving the event. For instance, the trial for fixing the puzzle was conducted when the instructor and participant were involved in completing a puzzle.

All sadness/pain trials were conducted either during play time (ex. when the instructor fell down or was hurt or won a game) or when the instructor contrived a situation to use an instrument (ex. saying “let’s cut papers and make some parking tickets for our pretend game” and then proceeded to initiate a trial involving getting hurt by the scissors).

Treatment

During treatment, the discriminative stimuli for training and probe trials were presented in the same manner as baseline. Correct responses were reinforced with behaviour specific praise (“I am so glad you are offering help”) and access to preferred toys and activities while incorrect responses were ignored. Each emotion category had 20 discriminative stimuli,

16 of which were used as training stimuli and the remaining four were presented during probe trials. One exemplar was randomly chosen from each sub-category and assigned as a probe trial, making it a total of four probe exemplars per antecedent emotion category. Each session consisted of ten training trials and four probe trials delivered in a random order by two instructors across two settings.

The instructor delivered verbal prompts (e.g. Say “I can help you”) in a prompt-delay sequence to prevent errors and facilitate correct verbal responding. In addition, manual prompts for frustration trials were provided to establish correct motor responses. For the first three sessions, prompts were delivered at 0-s delay. From the fourth session onwards, prompts were delivered after a 1-s delay. Delay lengths were increased by 1 s with a maximum delay of 3 s following each session in which the participant responded correctly to any four trials out of ten.

Generalization to Non-training Probe Stimuli and Follow-Up

Probe trials were randomly interspersed during all treatment sessions. They were presented in the same manner as during baseline. The non-training discriminative stimuli presented during each probe trial belonged to the same antecedent emotion category that was being trained. A conversational exchange followed correct responses, and no feedback was provided for incorrect responses.

A follow-up session was conducted to determine maintenance of empathy responses over time without access to training. It was conducted approximately 30-days post-intervention for both participants, and four probe trials were conducted for each emotion. The trials were conducted by the same instructors who were part of the treatment sessions in the same manner as baseline.

Experimental Design

A delayed multiple baseline design across response categories was used to assess the extent to which the treatment package was effective in teaching empathetic responding across the three response categories (sadness or pain, frustration and happiness).

Results

Figures 1 (Antony) and 2 (Paul) depict the percentage of empathy responses emitted to affective discriminative stimuli during training and probe trials. The baseline data indicate a very low level of empathetic responding in both participants. Following the successive introduction of treatment, increased responding to both teaching and probe trials was observed.

The percentage of trials in which Antony responded empathetically increased from 0% during baseline to 100% during treatment for each of the three emotions. During probe trials, the percentage of responding increased from 0% during baseline for all emotions to 100% during sadness/pain trials, 100% during frustration trials and 100% during happiness trials. The percentage of trials in which Paul responded empathetically during teaching trials increased from 0% during baseline to 100% across all three emotions. His empathetic responses during probe trials increased from 0% during baseline to 100% during sadness/pain, 100% during frustration and 75% during happiness probes.

Discussion

Empathy is often documented as a deficit area in children with autism (Baron-Cohen et al., 1985), and a child's ability to show concern or interest when someone is in pain, happy or frustrated determines the likelihood of positive interactions with peers and family members (Charlop & Walsh, 1986). Access to social interaction and reinforcement is of special relevance to children like Antony who are transitioning to general education classrooms but often fail to form friendships with their typical peers.

The purpose of the present study was to assess the extent to which multiple exemplar training, prompt delay and reinforcement were effective in teaching empathy skills to children with autism. Prior to the treatment, the children in the study exhibited no empathetic responding. Following the systematic application of multiple exemplar training, appropriate empathetic responding increased in both participants showing that the treatment was effective. Each child learned to emit empathetic responses during training trials conducted in the presence of discriminative stimuli drawn from each of three emotions.

Generalization of responses was evident during probe trials drawn from the same categories as those used during training. In addition, maintenance of responses was observed during a follow-up session conducted 30 days after the conclusion of the study. The results indicate that children with autism as young as 5 years of age can exhibit appropriate empathetic responding in social settings and that these skills can generalize to stimuli not directly targeted during training.

The present study attempted to operationalize the discriminative stimuli that evoke an empathy response in the natural environment. While preexisting studies on teaching empathetic responding have used verbal and affective stimuli or verbal and motor stimuli, the present study used a combination of all three (verbal, motor and affective) discriminative stimuli to teach appropriate responding. Responses were ensured to come under the control of relevant discriminative stimuli by conducting treatment sessions in two settings and using two

Fig. 1 Percentage of correct empathy responses during training and probe trials for Antony. *Filled circles* are probe trials, and *hollow circles* are training trials

real persons. Finally, maintenance of responses was observed during the follow-up session conducted after the conclusion of the study.

A skill is functional when the discriminative stimuli present in the natural environment successfully evoke the appropriate

response (Stokes & Baer, 1977). Although the stimuli that evoke empathetic responses in the real world are quite diverse and complicated, in future research, attempts must be made to operationalize these variables and incorporate them in the training conditions. The present study successfully used three

Fig. 2 Percentage of correct empathy responses during training and probe trials for Paul. Filled circles are probe trials, and hollow circles are training trials

stimuli—affective, verbal and motor—to evoke empathetic responding. However, the individual contributions of each stimulus in occasioning the controlling response were beyond the scope of the present study. These stimuli were identified following an observation of children in the natural setting (Marzullo-Kerth et al., 2011). A case analysis of using the three stimuli individually and in combination would be an area for future work. By interspersing, these trials with ones that do

not require an appropriate empathy response would provide more weightage to the functionality of the response. It would therefore be beneficial to have some situations involving the same materials but no affective or verbal stimuli indicating the need for a comforting or helping response.

One other limitation of the study is that the social validity of the outcomes was not assessed. Future researchers might consider assessing whether the empathetic responses of the

participants are rated as similar to those of their neuro-typical peers. All trainers in this study were adults, due to non-availability of peers in the treatment setting. Given the amount of training that was required, it may be more effective to involve peers during the treatment. Additionally, the same adults were involved during training as well as probe trials raising doubts about whether this skill will generalize to other people. Conducting probe trials with new people might be an area for future research.

A stopwatch was used to measure 1-s increments in prompt delay during the treatment. The procedural difficulty associated with accurately measuring 1-s increments makes this hard to replicate. Future research might evaluate the benefits of 3-s increments over 1-s increments. It may also be noted that each treatment session had a high ratio of training to probe trials. It may be beneficial to examine whether a lower number of training trials per session would still facilitate generalization.

Additionally, the training for each stimulus category (happiness, sadness and frustration) began only after the previous category had been mastered. After mastery, maintenance probes were conducted, during which trials belonging to all categories were presented together. Both participants responded appropriately (almost 100% correct responding) and switched between responses appropriate for each contextual situation. Although this is noteworthy, future research might plan for some overlap between treatment sessions of each category.

Overall, the findings of this study indicate that it is possible for appropriate empathetic responding of children with autism to come under the control of relevant discriminative stimuli. This is consistent with existing research in that failures in empathy are due to a stimulus control problem—an inability to discriminate between various displays of affect, rather than a deficiency in the repertoire itself (Bailey, 1981; Lovaas et al., 1979).

In the present study, toys, praise and activities were delivered contingent upon correct empathy responses during treatment. For these responses to be maintained beyond training, the natural contingencies of reinforcement must operate on the behaviour. Although the responses taught during the study were maintained during the probes conducted in the follow-up session, fading the use of toys and activities as reinforcers would be an area for future work. Empathy is likely maintained in the natural environment by increased interaction with peers and friends. One of the reasons for deficient empathetic responding in children with autism could be attributed to the consequences in the natural environment not having a reinforcing value (Marzullo-Kerth et al., 2011). The challenge would then become to condition peer interaction and friendships as possible reinforcers.

Multiple exemplar training might have been responsible for the generalization of empathy responses. Although the discriminative stimuli for empathetic responding in the natural environment might be complex and varied, learning to

respond appropriately when someone is in pain or happy or needs help is an important step towards addressing empathy deficits in children with autism.

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Compliance with Ethical Standards

Funding There was no funding obtained for this study.

Conflict of Interest The author declares that she has no conflict of interest.

Ethical Approval All procedures performed in this study involving human participants were in accordance with ethical standards of the institution and national research committee and with the 1964 Helsinki Declaration and its later amendments.

Informed Consent Informed consent was obtained from all individual participants in this study.

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