Children with autism spectrum disorder: Teaching conversation involving feelings about events

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Short title: tacting private events

Abstract

Introduction: Two procedures were developed to teach individuals with Autism Spectrum Disorders labels (tacts) for various private events (emotions): Study 1 attempted to distinguish them from pure tacts and mands (requests); and Study 2 attempted to train initiating a conversation with grammatically-correct subject-verb-comment construction.

Methods: A multiple treatment reversal design was used in both studies, followed by a probe to see if the tacts were used across novel settings.

Results: The children were prompted to initiate a series of language exchanges, which resulted in an increased ability to participate in conversations about private events.

Conclusions: Together, the results of both studies suggest that, by providing an effective and reinforcing means of teaching both the function and the form of these tacts, conversations can be successfully initiated by children with ASD.

Keywords: private events; tacting; grammar; applied behaviour analysis; Autism Spectrum Disorders.

Delays in language development are a key problem for children with Autism Spectrum Disorder (ASD), and procedures designed to address this difficulty have long been the focus of research (e.g., Hart & Risley, 1968; Koegel, 2000; Ross & Greer, 2003; Sundberg & Partington, 1998). With specific difficulties in social language, both as speaker and as listener (Brook & Bowler, 1992; Rutter, 1978), children with ASD are often typified as using language that is defined as *idiosyncratic*, *neologistic*, and *dysprosdic* (Schreibman, 2005), and, often as a result of such language difficulties, are socially isolated (Bauminger, 2003; Bauminger, & Kasari, 2000; Carter, Davis, Kiln, & Volkmar, 2005). In particular, children with ASD struggle socially when required to respond to questions and comments, and, typically, contribute fewer narratives of personal experience than typically-developing children (Capps, Kehres & Sigman, 1999; Harris, de Rosnay, & Pons, 2005).

A central goal of most language-based interventions for children with ASD is to improve communication skills and increase exchanges. However, emotional competency is often overlooked in the development of communication and language-based curricula for children with ASD (see Ingersoll, 2011; Lovaas, 2003). Developing emotional competence through such means has been taken to be vital to participating in the social world for typically-developing individuals, and requires an understanding of the emotions of one's self and of others (Denham & Burton, 2003; Denham & Grout, 1993). Developing such functional communication skills involving emotions offers an opportunity to imbue the content of daily conversation with the language of emotion.

Several interventions have attempted to teach children with ASD about emotions in a social context, such as Social Stories (Gray, 2006), and school-based peer modelling (Ingersoll & Schreibman, 2006). However, these approaches do not always specifically attempt to teach a vocabulary for emotions, and, instead, focus on nonverbal recognition of emotions of others, often using computer-based technology tied to enhancing theory-of-mind

skills (see Ramdoss, Machalicek, Rispoli, Mulloy, Lang, & O'Reilly, 2012, for a review). However, as the language with which to express these emotions is thought to be missing or impaired for children with ASD (e.g., Hale & Tager-Flusberg, 2005; Lartseva, Dijkstra, & Buitelaar, 2014), such interventions may need to be augmented with additional teaching strategies.

Applied Behaviour Analytic (ABA) approaches have explicitly focused on the development of linguistic skills in a social context (Greer & Keohane, 2005; Koegel, O'Dell, & Koegel, 1987; McClannahan & Krantz, 1999; Sundberg & Partington, 1998). Naturalistic Developmental Behavioural Interventions (NDBI; see Schreibman et al., 2015, for a review) primarily rely on social context and naturally-occurring opportunities to teach communication. However, it is unclear that the collection of approaches encompassed under the NDBI umbrella share theoretically common ground (cf. ABA and SCERTS approaches). Whatever the eventual resolution of this theoretical debate, in practice, teaching an emotional vocabulary/language is still lacking across ASD interventions. Such approaches remain relatively overshadowed by those aimed at teaching pure tacting (Greenberg, Tsang, & Yip, 2014; Scahuffler & Greer, 2006), manding (Michael, 1988; 1993; Swerdan & Rosales, 2015), vocal imitation (Ross & Greer, 2003), and the development of first words (Tsiouri, Simmons, & Paul, 2012; Yoder & Layton, 1988). For example, Tsiouri et al. (2012) used the Rapid Motor Imitation Antecedent (RMIA) procedure in which the child's attention is caught, and then he or she is presented with actions to imitate. After completion of imitating the actions, the child was required to repeat a target word said by the teacher in order to receive reinforcement. While successful, these techniques do not focus on the instruction of language for emotions ('private events'), and absent from many of these programs is a focus on teaching tacts for private events as part of a functional communication approach. Given that emotional recognition and expression may be problematic for children with ASD

(Hale & Tager-Flusberg, 2005; Lartseva et al., 2014), an increased focus on this aspect of language would appear warranted (Walden & Knieps, 1996).

A focus on teaching the language of emotions, combined with the proven power of ABA approaches (see Makrigianni & Reed, 2010, for an outcome-effectiveness review of ABA approaches in the context of ASD), may provide a stepping stone to improved emotional literacy, as it does in the typically-developing population (Bretherton, Fritz, Zahn-Waxler, & Ridgeway, 1986; Denham & Grout, 1993). In particular, the use of symbolic communication systems has been suggested as a good medium to aid the development of emotional expression for children with ASD (see Kasari & Lawton, 2010; Park, Yelland, Taffe, & Gray, 2012, for discussion). With instruction, children can become increasingly more capable of using the language of emotions (Fabes, Eisneberg, McCormick, & Wilson, 1988). This is thought to be fundamental to a child's ability to form relationships and interact socially (Howes, 1987). Moreover, it has also been shown that components of emotional competency can predict academic and social success (Izard, Fine, Schultz, Mostow, Ackerman, & Youngstorm, 2001; Shields, Dickstein, Seifer, Guisti, Magee, & Spritz, 2001), while contributing to improvements in social aptitude (Shields et al., 2001).

Given the above, the present studies aimed to explore whether the use of ABA teaching techniques, previously shown to improve language comprehension, would promote the use of a set of labels (tacts) for private events by children with ASD (Study 1). Additionally, the studies aimed to explore whether this approach could aid learning about grammatically-appropriate structures for emotion-based language by children with ASD (Study 2).

Study 1

The current research built upon earlier studies in which tacts for private events ('fun', 'boring', 'like', 'don't like', 'easy', and 'hard') were taught to children with ASD (Conallen & Reed, 2012; 2016). In the present study, opportunities were given to children with ASD to use the language of private events (target responses included the previously taught: 'fun', 'boring', 'like', 'don't like', 'easy', and 'hard') to initiate a conversational unit regarding their private experiences, after a period of play. The study then assessed whether these conversations would generalise to allow comment on the private experiences from non-trained activities. It was hoped that this process, consequently, would foster increased understanding of emotional states.

Method

Participants

Ten children (8 male and 2 female), between the ages of 5.6 and 9.1 (mean age = 6.7) years, participated. All of the children had been diagnosed by an independent Paediatrician with childhood autism using the DSM-IV-TR (APA, 2000) criteria, and they had a Gilliam Autism Rating Scale (GARS-II) quotient of between 68 and 111 (mean = 100 [average autistic severity], standard deviation = 15). Table 1 gives full details for each participant.

--- Table 1 about here ---

All participants were receiving home-based ABA instruction (designed as a component program of the CABAS® systems approach; Greer, 2002). Although about half of the children were verbal, the therapists had noted that the children's spontaneous verbal initiations were limited to a set of single-word mands, and/or pointing or pulling adults, to desired items or activities. However, the children previously had been taught to

communicate through PECS, and this was, therefore, thought to be the best medium through which to conduct the current teaching. All participants could respond to simple questions, such as: "*Is this blue?*" using this system (described by Conallen & Reed, 2012). In this training the children all employed all of the labels correctly – i.e. they could use both positively and negatively valued labels. The children had also been taught to label emotions of others in specific situations prior to this training (described by Conallen & Reed, 2016). None of the children would initiate an interaction with another child without prompting. The children had a mean age-equivalent score of 3 years on the Test of Pragmatic Language (Phelps-Terasaki & Phelps-Gunn, 1992).

Setting and Materials

The research was conducted in the participants' homes, and was integrated into their home-based ABA programs. Each room where the training was conducted contained a work table, a set of chairs, program materials, and a bookcase on which toys and reinforcers were displayed in transparent storage bins, labelled with picture symbols identifying what materials were contained in each bin.

A schedule board was clearly displayed in each room, and a set of coloured-symbol cards (2x2 inch), for each of the play activities, with a Velcro® back, were arranged in a schedule book (picture-symbol cards were made using Meyer-Johnson Board Maker). The conversation prompt 'talk' cards were included on the visual schedule, placed between each activity card during Baseline and Teaching phases, with pre-selected conversation response cards included in the PECS book. These cards included symbols representing tacts for private events (either: 'fun' and 'boring'; 'like' and 'don't like', 'easy' and 'hard'), which the children had already learned, and the symbols for 'yes' and 'no'. The conversation prompt cards were designed to prompt the child to initiate a conversational unit.

One teacher with a one year's teaching experience in an ABA home program conducted all of the sessions. A senior ABA Behaviour Analyst, with 20 years' experience in this field and with an MA in ABA, supervised all training and teaching sessions. Sessions were conducted up to three times per day, for a period of 40min each, five days per week.

Behaviour Definitions (Dependent Variables)

Initiating a Conversation. Correct responses were defined as retrieving the appropriate conversation picture card (a picture symbol of a tact for a private event), and exchanging it to initiate a conversational unit. To be correct, the participant needed to select either: 'fun', 'boring', 'like', 'don't like', 'easy', and 'hard', from the main PECS book. An incorrect response was defined as the child not offering a picture symbol for exchange, or selecting a picture symbol that was either not one of the private events, or another pure tact or mand that was not related to the activity previously completed. Verbal responses from the children were not accepted in this phase, or any subsequent phase, of the study (however, none of the participants actually gave verbal responses).

The Conversational Unit. The conversational unit was defined as an interaction including at least one of the pre-selected tacts for private events ('fun', 'boring', 'like', 'don't like', 'easy', and 'hard'). Each unit was defined as a child placing one of the picture symbols onto a sentence strip, and exchanging it with a 'language partner' (the teacher). Each exchange was paired with an appropriate sign during all phases of training. This interaction was followed by the instructor 'listening' to the child's initiation, and responding in turn. A typical conversation might be as follows: the child organises a sentence strip that reads: "*Like colouring.*", after completing a colouring task; to which the teacher listens, and responds: "*You've coloured a tree!*". This conversation is then followed by the teacher confirming the

child's response by asking the child: "*Did you like colouring?*"; to which the child answers, either: "*Yes, like colouring.*"; or "*No, don't like colouring.*".

Generalisation Probes. Following the Return-to-Baseline phase, a Generalisation Probe was conducted to determine whether participants would respond to a 'talk' prompt across non-play scheduled activities, including: after school, after program work, after meal/snack, after video, after music, and after outdoor play. The Generalisation Probe was an opportunity to test whether the previously taught tacts for private events would occur at other times, or in other places, without having to be taught for those particular times or places. With the 'talk' prompt in the PECS book, children were offered the opportunity to initiate a conversation by selecting the 'talk' symbol, and selecting an appropriate symbol card for exchange. Initiations were scored correct if they included a tact for a private event and the activity symbol (e.g., "*School fun.*") that was deemed appropriate for each opportunity. The therapist would agree with the child's tact as long as the activity was correct, and a private event tact was chosen, regardless of the directionality of that private event tact.

Experimental Design and Measurement

Baseline – Responding to a 'Talk' Prompt (A). During Baseline, a measure of participants' abilities to initiate a conversational unit in response to a 'talk' prompt card placed on the visual schedule was taken. The 'talk' symbol was introduced in order to prompt the child to initiate a conversational unit by exchanging the 'talk' card with their teacher, which was scored as a mand for talking. Once the 'talk' card was exchanged, the child was then expected to select a symbol for either: 'fun', 'boring', 'like', 'don't like', 'easy', or 'hard', to exchange as an initiation of the conversational unit. The conversational

unit was defined as the exchange of a picture symbol between the child and teacher. The number of sessions in this phase ranged across the participants from 5 to 43 (mean = 12).

Teaching – Initiating a Conversation (B). The Baseline conditions were maintained, with the addition of a full physical/echoic prompt to shape the appropriate response to the 'talk' card and the conversational unit. In this phase, the teacher physically prompted the child to exchange the 'talk' prompt, followed by the presentation of the private events choices. These were modelled with a full echoic response, which was then faded after five consecutive sessions of 100% correct responding. The presentation of the 'talk' card to the teacher was scored as a mand to talk. The teacher was then able to direct the child to the choices for each activity and the associated private events ('fun', 'boring', 'like', 'don't like', 'easy', or 'hard'). The child was then able to select from these six choices, and their choice was then modelled as a full echoic by the teacher. This was scored correct if the child modelled the response, and was scored incorrect if no response, or a different response, was offered. This was followed by a confirmation opportunity, during which the child was asked if the activity was either: 'fun', 'boring', 'like', 'don't like', 'easy', or 'hard'; with a 'yes' or 'no' response from the child. These data were collected to assess the internal validity of a child's response. The number of sessions in this phase ranged from 13 to 38 (mean = 24).

Return-to-Baseline (C). The 'talk' prompt remained on the schedule board, between each play activity, and the choice board for private event responses remained available. Participants were required to retrieve and exchange the 'talk' card, independently, and to initiate the conversational unit with one of the private event cards. Each step required an exchange. There were 5 sessions in this phase for each participant.

Generalisation Probes (D). Conversation opportunities included: after school, after program work, after meal/snack, after video, after music, and after outdoor play. Generalisation Probes were completed in a mixed order across these settings for all

participants, and coincided with natural opportunities in each child's schedule. During these opportunities (10 different conversation opportunities for each of the 6 different situations), participants were presented with the 'talk' card to prompt the conversational unit, after which the participant could select an appropriate response, in the form of 'fun', 'boring', 'like', 'don't like', 'easy, or 'hard'. The conversational unit was defined as the exchange of symbols.

Inter-observer Agreement

Inter-observer agreement was calculated using Cohen's Kappa and across 100% of the sessions for each child. For Baseline (A), the mean score across participants was 0.96 (range = 0.58 – 1.0); for Teaching (B), the mean was 0.91 (range = 0.60 – 0.98); and for Return-to-Baseline (C), the mean was 0.88 (range = 0.58 – 1.0). Mean agreement for the Generalisation Probes across participants was: 0.96 (range = 0.88 – 1.0) for after school; 0.87 (range = 0.60 – 1.0) for after program work; 0.96 (range = 0.88 – 1.0) for after meal/snack; 0.91 (range = 0.58 – 1.0) for after video; 0.92 (range = 0.55 – 1.0) for after music; and 0.85 (range = 0.58 – 1.0) for after outdoor play.

Results and Discussion

--- Figures 1 and 2 about here ---

Figure 1 shows the mean number of correct responses (out of a maximum of 10) emitted across the final three sessions of each phase – Baseline (A), Teaching (B), and Return-to-Baseline (C), phases. Representative individual data are shown in Figure 2. During Baseline, there were very few correct responses, suggesting participants were not able to independently respond to a prompt to 'talk' about the activity that they completed immediately prior to the presentation of the 'talk' card. Correct responses increased across

the Teaching phase to a mean of 10 correct by the end of the phase. During Return-to-Baseline, correct responding maintained at higher rates than in Baseline, offering evidence that participants had learned to independently comment on their activity when an opportunity was offered, following the completion of a task.

A one-way repeated-measures analysis of variance (ANOVA) was conducted on these data, which demonstrated a statistically significant effect of phase, $F(3,27) = 227.07$, $p < .001$, $\eta^2_p = .962$. Protected t-tests conducted between each phase (Bonferroni correction requires $p < .008$ for significance), revealed statistically significant differences between all phases, smallest $t(9) = 8.28$, except for between the end of training and Return-to-Baseline, $t(9) = 2.63$, $p > .02$.

---- Figure 3 about here ---

The mean percentage correct responses in the subsequent Generalisation Probes across the six novel environments (listed above), designed to evaluate the effectiveness of the 'talk' prompt in untrained situations, are shown in Figure 3. These data show that the ability to initiate a conversation during controlled instructional opportunities was maintained in untrained novel situations, and the low variance indicates that this held for all participants (lowest correct mean on any transfer test was 80%).

In sum, the results show that: (a) the introduction of the 'talk' card, designed to prompt the conversational unit, was an effective means to teach the participants to engage in a conversation with their 'language partner'; (b) conversations based on private events could be initiated by children with ASD; and (c) these conversations could then be generalised to novel situations.

Study 2

In the second study, a measure of correct subject-complement 'utterances' was taken during post-activity conversational opportunities to allow the use of the 'private event' as a feature of more complex sentence constructions. To this end, opportunities were built into a visual play schedule to prompt participants to initiate a conversation with a 'language partner' (McDuff, Krantz, & McClannahan, 1993; Stormer, Kimball, Kinney, & Taylor, 2006), with the aim of encouraging a conversational unit based on a private event ('fun', 'boring', 'like', 'don't like', 'easy', and 'hard') in the form of a complex utterance (including a *subject-verb-comment* sequence).

Method

Participants, Setting, and Materials

The same participants described in Study 1 were included in this study, which started immediately after they had completed Study 1. The setting and materials were as described in Study 1.

Behaviour Definitions (Dependent Variables)

Forming Subject-Complement Sentence Strips. A correct response was defined as retrieving a symbol card for the private event ('fun', 'boring', 'like', 'don't like', 'easy', or 'hard'), and creating a subject-complement relationship between the private event and task completed (e.g., "*Connecting puzzles were fun.*"; "*I like reading books.*"; "*Building LEGO® was hard.*"). This teaching was followed by a confirmation response, in which the child was asked to confirm their initiated statement, which required a response, such as: "*Yes, puzzles were fun.*"; or "*No, puzzles were boring.*".

Conversational Unit. The child was required to organise a sentence strip forming a complete sentence, drawn from a selection of symbols in the PECS book, which included symbols for tacts (e.g., 'fun' and 'boring', 'like' and 'don't like', 'easy' and 'hard'), activity pictures (e.g., puzzles, DUPLO®, colouring, spelling, sums, etc.), distractor cards (a mixture of nouns and verbs), action words (e.g., 'played', 'building'), and the symbols for 'yes' and 'no' (textual cards). Each time the participant exchanged a sentence strip, maintained eye contact with the teacher, and attended to the teacher's response, it was scored as a communicative response. Eye contact was required, as this sentence-construction task was thought to be a more complex behaviour to request from the child, and maintained eye-contact was thought both to be a help in this teaching process and an indication that communication was intended. Each initial conversational unit was followed by a question-of-confirmation unit, which was scored to verify that the child's emitted tact matched the child's perception of the meaning of the private event. When the initial comment matched the question-of-confirmation, the conversation unit was scored as correct. If eye contact was not maintained, or the confirmation response did not match, then the conversational unit was scored incorrect.

Generalisation Probes. A Generalisation Probe was conducted to determine whether the children could form subject-complement sentences across a selection of non-scheduled activities, including: after school, after program work, after meal/snack, after video, after music, and after outdoor play. With subject and complement symbols in the PECS book, participants were offered the opportunity to initiate a conversation by selecting the appropriate symbol cards for a subject-complement 'utterance', which had to include the activity and a private event. Initiations were scored correct if they included a tact for a private event and the activity symbol (e.g., "*School was fun.*"), that was deemed appropriate for each opportunity.

Experimental Design and Measurement

Baseline – Building a Simple Sentence (A). With the 'talk' prompt in place, the form of the response was considered in this study, and a measure of correct subject-complement usage was taken (including a measure of word choice and word order). During the Baseline, children were offered the opportunity to expand upon their initiations, by including subject, verb, and comment (private event), symbols onto a sentence strip. The additional symbol cards needed for this were made available, along with distracter cards, to the children. The number of sessions in this phase ranged from 5 to 35 (mean = 14) across participants.

Teaching – Shaping Subject-Verb-Comment Sentence (B). The Baseline conditions were maintained, with the addition of a full physical/echoic prompt to shape the appropriate response to the 'talk' card and the conversational unit. That is, the teacher physically prompted the child to build a sentence. These responses initially were modelled (along with a full echoic response), and the modelling was then faded after five consecutive sessions of 100% correct responding. The presentation of the sentence strip to the 'language partner' was considered a conversational initiation, and was followed by a validating question, which required a 'yes' or 'no' reply from the child. The number of sessions in this phase ranged from 7 to 32 (mean = 22).

Return-to-Baseline (C). The 'talk' prompt remained on the schedule board between each activity, and the choice board for private event responses remained available. Participants were required to retrieve and exchange the 'talk' card, independently, and to initiate the conversational unit with a complete sentence that included a private event, commenting on the previously completed activity. There were 5 sessions in this phase for each participant.

Generalisation Probes (D). The Baseline conditions were maintained during untrained activities across the participants' days. Conversation opportunities included: after school, after program work, after meal/snack, after video, after music, and after outdoor play. During these probes (10 opportunities in each setting), the participants responded to the 'talk' card in the visual schedule by initiating a conversational unit, and forming a simple sentence, which included a subject-verb-comment sequence. The conversational unit was defined as the exchange of the sentence strip, while maintaining eye contact, followed by a 'yes' or 'no' question validating the initiation.

Inter-observer Agreement

Inter-observer agreement was calculated as described for Study 1. The Cohen's Kappa for the Baseline (A) had a mean across participants of 0.84 (range = 0.56 – 1.0); for Teaching (B), the mean was 0.89 (range = 0.64 – 1.0); for the Return-to-Baseline (C), the mean was 0.92 (range = 0.68 – 1.0). Mean agreement for the Generalisation Probes (D) was: 0.90 (range = 0.57 – 1.0) for after school; 0.92 (range = 0.58 – 1.0) for after program work; 0.92 (range = 0.68 – 1.0) for after meal/snack; 0.84 (range = 0.56 – 1.0) for after video; 0.90 (range = 0.76 – 1.0) for after music; and 0.96 (range = 0.74 – 1.0) for after outdoor play.

Results and Discussion

---- Figures 4 and 5 about here ---

Figure 4 displays the mean correct responses of participants in the Baseline (A), Teaching (B), and Return-to-Baseline (C), phases. Figure 5 shows representative individual data. During Baseline, there were very few correct responses, and these increased across the Teaching phase. During Return-to-Baseline, correct responding remained high. A one-way repeated-measures ANOVA revealed a statistically significant effect of phase, $F(3,27)$ =

340.33, $p < .001$, $\eta^2_p = .974$. Protected t-tests conducted between each phase (Bonferroni correction requires $p < .008$ for significance) revealed statistically significant differences between all phases, smallest $t(9) = 4.00$, except for that between end of training and return to baseline. These results suggest that the participants had learned to independently comment on their previous activity, using grammatically-appropriate sentence constructions, when an opportunity was offered to them, following the completion of a task.

---- Figure 6 about here ---

The mean percentage correct responses in the Generalisation Probes across novel situations are shown in Figure 6. These data reveal that the taught ability to initiate a grammatically-correct conversation was maintained in novel situations. As in Study 1, the low variance suggests that the level of transfer was similar for all participants.

General Discussion

The current studies investigated whether it was possible to teach children with ASD to initiate a conversation by them tacting a private event, while extending the conversational unit to increase the number of exchanges; and whether it was possible to improve the grammatical complexity of these conversational exchanges. A measure of generalisation across untrained settings and activities was also taken. This study was undertaken to develop previous work conducted on this topic (Conallen & Reed, 2012), and extend the range of linguistic areas that ABA approaches can be used to help teach (cf. Greenberg et al., 2014; Ross & Greer, 2003; Swerdan & Rosales, 2015; Tsiouri et al., 2012).

The findings suggest that having access to appropriate language with which to talk about emotional and cognitive states (private events) enables children with ASD to initiate a structured conversation about their own individual experience on completing an activity or

task. An increase in conversation initiations in novel settings was also found to be a further beneficial effect of the training. These findings offer evidence that children with ASD can learn to use, and generalise, the language for emotions, when these are systematically taught through direct instruction (see also Fabes et al., 1988). This ability may reduce the difficulties that they experience with social understanding and social relationships (Howes, 1987), and reduce challenging behaviours resulting from frustration experienced in these situations (Izard et al., 2001; Shields et al., 2001).

Additional study needs to be undertaken to secure the validity of the current findings, and to extend the range of private events investigated. The present studies used only a small sample of children with ASD, which needs to be expanded in future research. Measuring the IQ of the participants, especially their verbal IQ, would allow a better understanding of the impact of this dimension of functioning on the current teaching procedure. It should be noted that the probes did not use an unfamiliar person to test the participants' abilities to initiate a conversation, which may also impact the degree of generalisation observed. Although all sessions were overseen by a very experienced behaviour analyst, which should have ensured treatment fidelity, a direct measure of this could be included in any future study.

The present results should be interpreted in the context in which they were measured, and not as an indication that the initiation of conversation under investigation is a generative form of verbal behaviour. Rather, they are an indication that explicit teaching needs to address the deficits that children with ASD experience in constructing narratives of personal experience. Although there were clearly ascending trends across all phases of instruction, and the corresponding Generalisation Probes, it is important to remember that the contexts in which these measures were taken were highly contingent and controlled ABA home-program sessions.

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Table 1: Participant, age, gender, diagnosis, autism quotient, percentile rank, autism probability/severity, and modality of communication.

Participant	Age/Gender	Diagnosis	Autism Quotient	Percentile Rank	Probability/ Severity	Speaker Skills
Student 1	5.6 / M	Autism & developmental dyspraxia	70	2%	Below Average	PECS
Student 2	5.8 / M	Autism	85	16%	Below Average	Vocal Verbal
Student 3	6.5 / M	Autism & unspecified communication disorder	100	50%	Average	PECS
Student 4	6.0 / M	Autism & developmental dyspraxia	68	1%	Very Low	PECS
Student 5	7.5 / M	Autism	80	9%	Below Average	Vocal Verbal
Student 6	5.6 / M	Autism	93	32%	Average	Vocal Verbal
Student 7	5.6 / M	Autism	111	77%	Above Average	Vocal Verbal
Student 8	8.9 / M	Autism	110	75%	Above Average	Vocal Verbal
Student 9	6.7 / M	Autism	85	16%	Below Average	Vocal Verbal
Student 10	9.1 / F	Autism & unspecified communication disorder	110	75%	Above Average	Manual Sign

Figure 1: Study 1. Mean number of correct conversations for participants during Baseline, Teaching, and Return-to-Baseline phases. Error bars = standard error. Scale is to 12 to accommodate error bars.

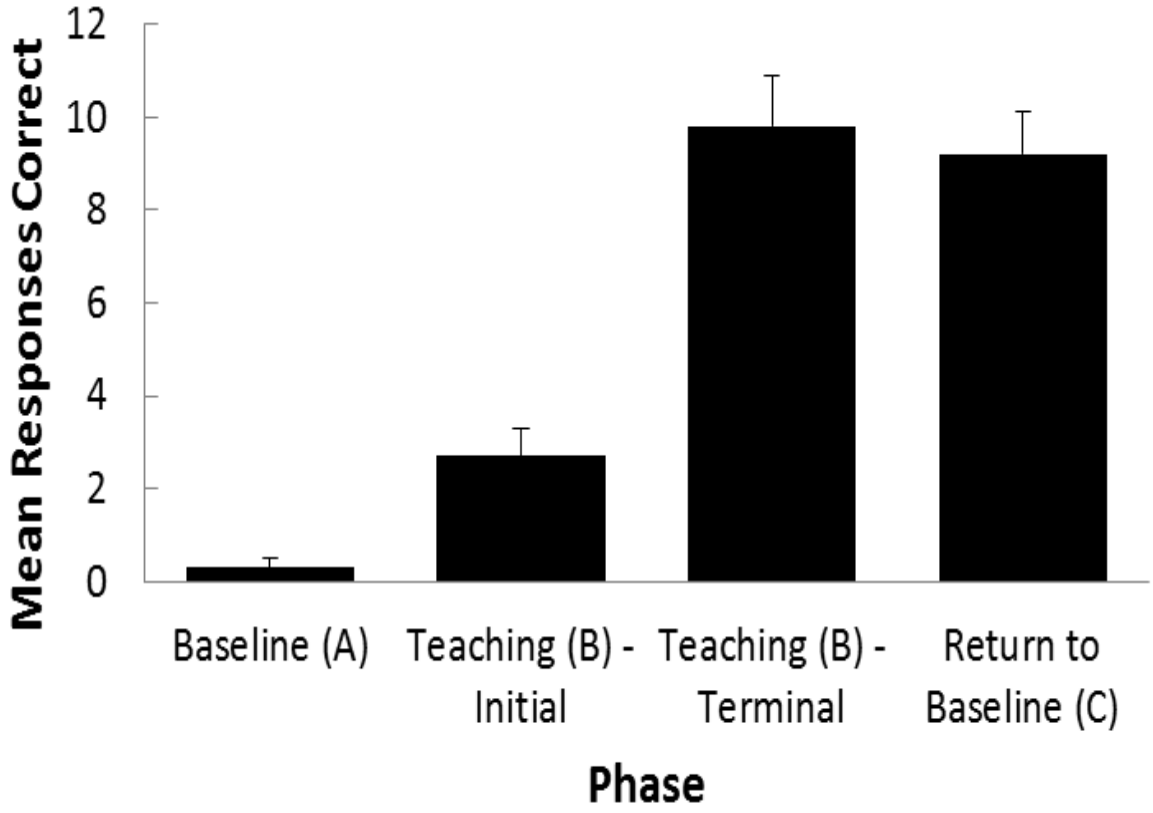

Figure 2: Representative individual data for Study 1.

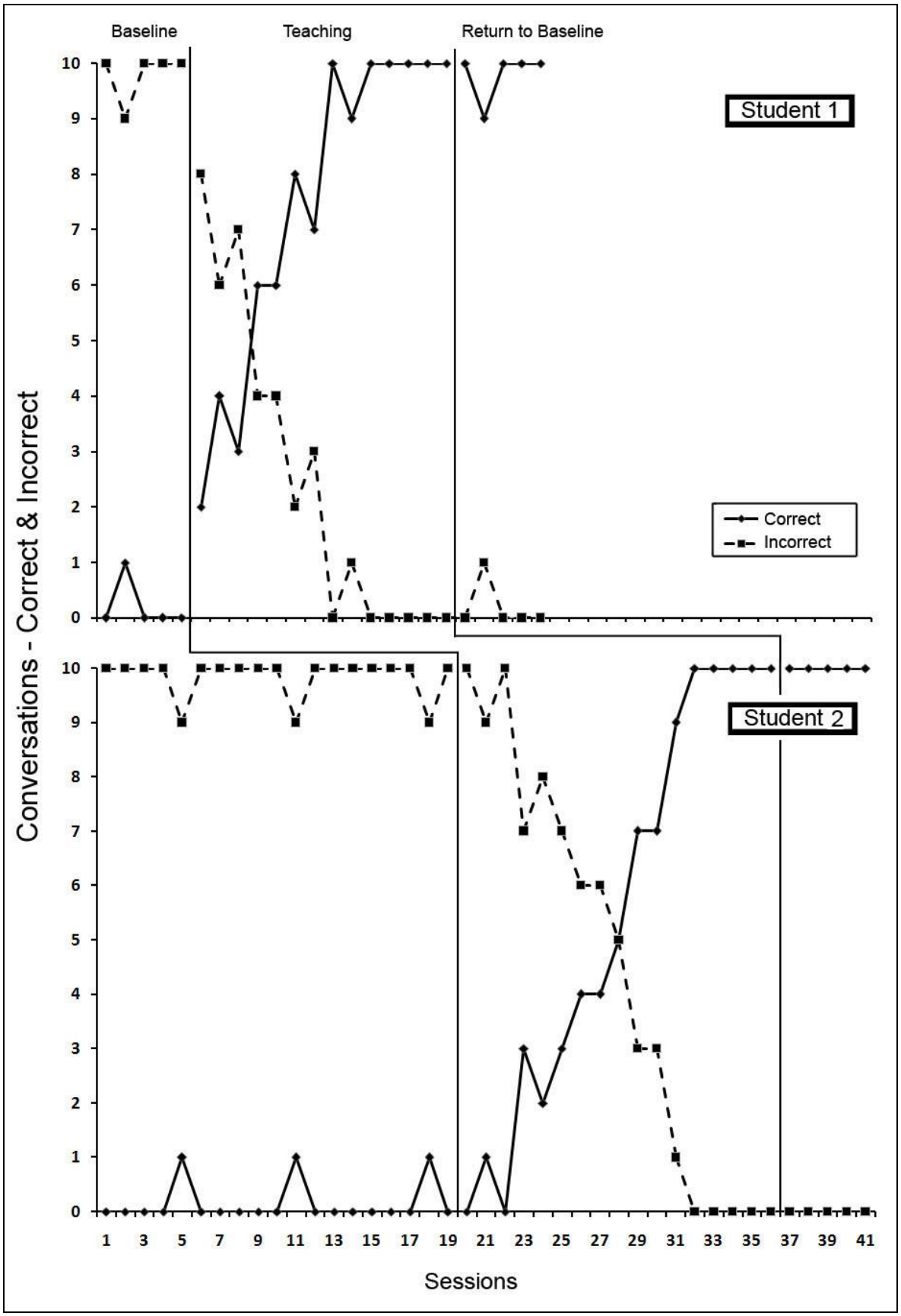

Figure 3: Study 1. Mean percentage correct Generalisation Probes in each novel environment (bars represent standard deviations – scale goes to 110 merely to accommodate standard deviation bars).

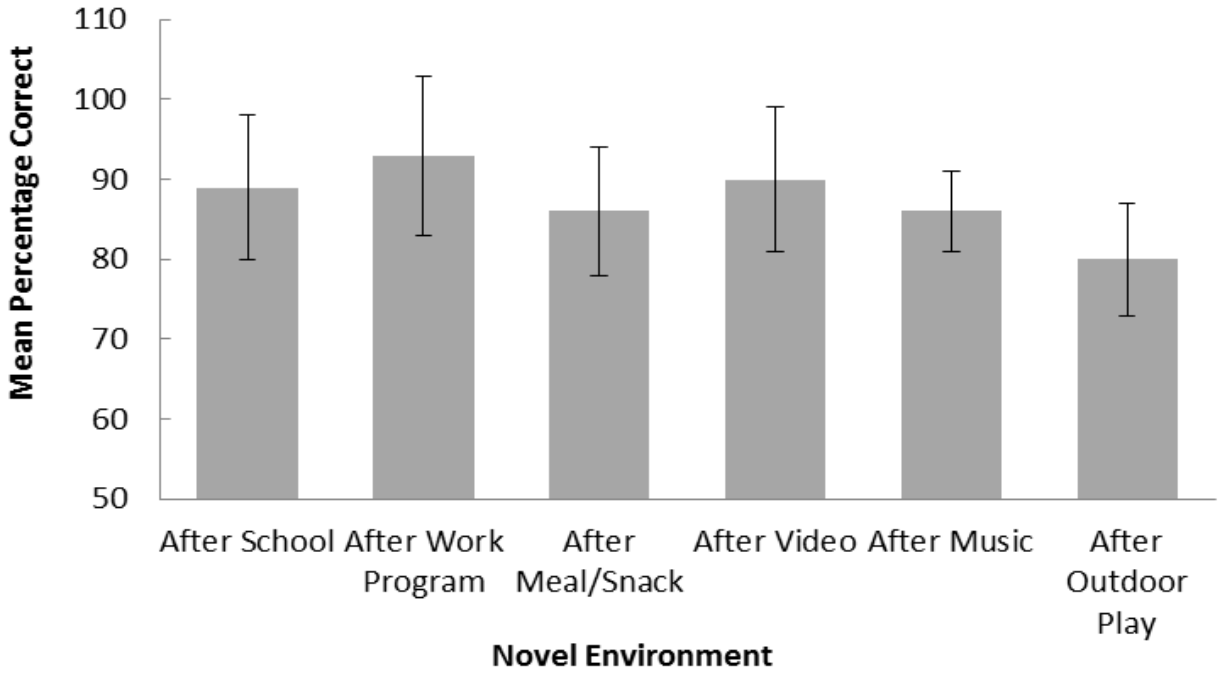

Figure 4: Study 2. Mean number of correct conversations for participants during Baseline, Teaching, and Return-to-Baseline phases. Error bars = standard error. Scale is to 12 to accommodate error bars.

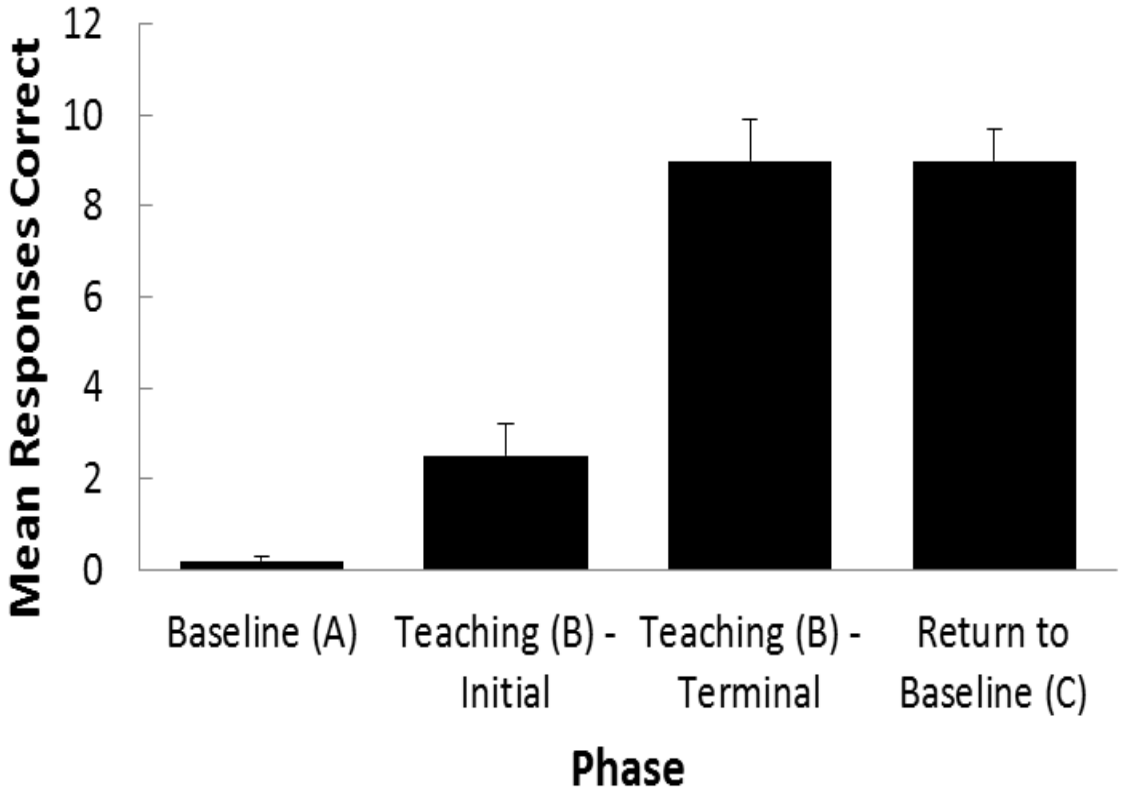

Figure 5: Representative individual data for Study 2.

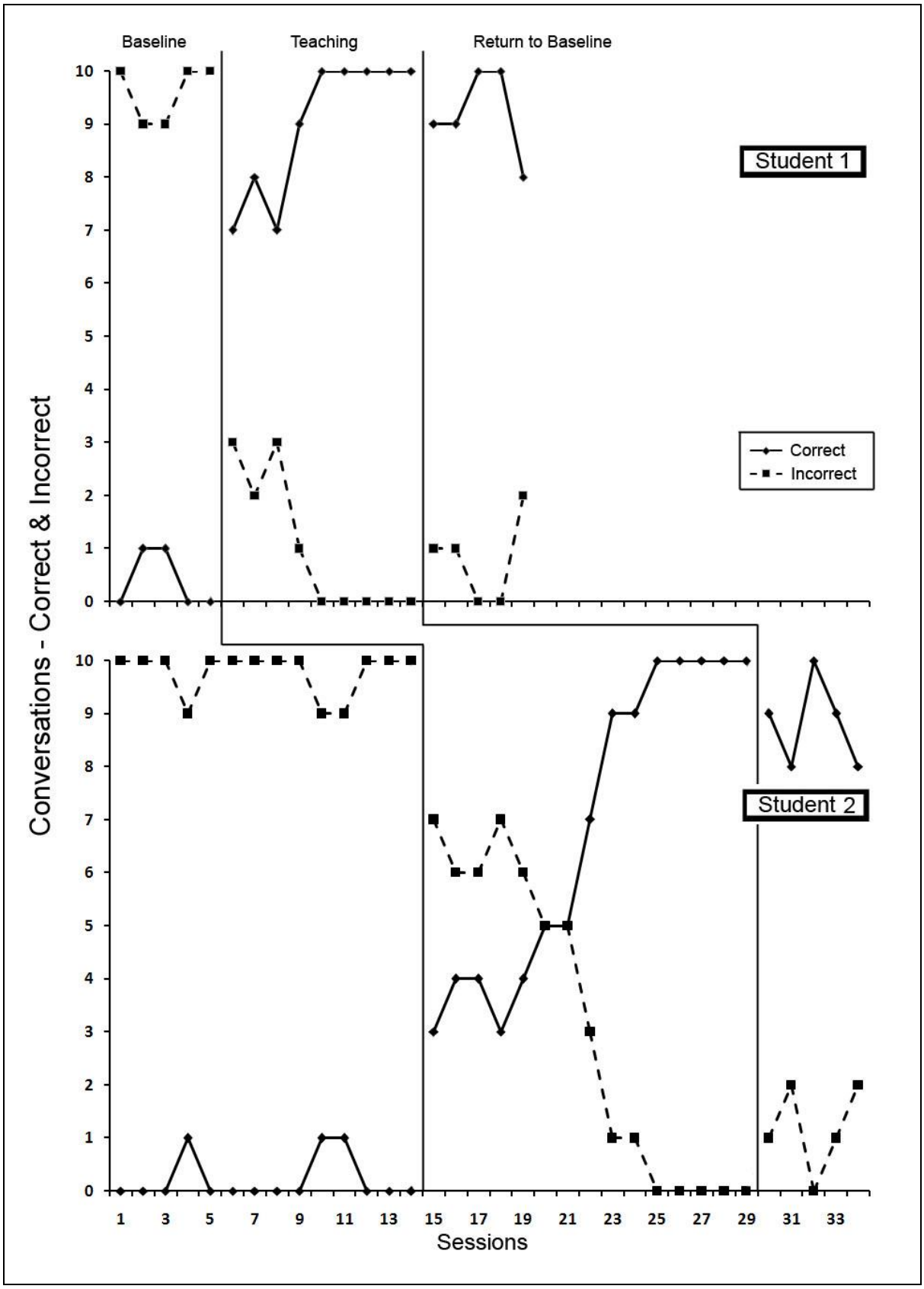

Figure 6: Study 2. Mean percentage correct Generalisation Probes in each novel environment (bars represent standard deviations – scale goes to 110 merely to accommodate standard deviation bars).