CHAPTER 4

Joint Attention and Social Referencing in Infancy as Precursors of Derived Relational Responding

Martha Peláez,
Florida International University

Joint attention and social referencing appear to be critical features of parent-child or teacher-learner exchanges, which help the learner gather information to guide his own thoughts, feelings, and behavior. These two related abilities also appear to be necessary precursors for the emergence of derived relational responding, which underpins much of higher cognition and language development. The current chapter focuses on teaching strategies for establishing these core skills with very young learners or learners with developmental delay, including those with autism spectrum disorder. The first section of the chapter discusses strategies, including a protocol, for the establishment of the prerequisite skills for joint attention and social referencing in terms of training conditional discriminations and identity matching. The second section describes behavioral interventions and strategies for establishing the core features of joint attention and social referencing.

Establishing the Prerequisite Skills for Joint Attention and Social Referencing

As well as constituting core social skills, joint attention and social referencing are codependent abilities that are derived from basic visual discriminations, which have long been known to be prerequisites for derived relational responding. This early integration of

cognitive and social processes is clearly reflected in the overlap between learners' abilities to form conditional discriminations, derive relations, develop language, and interact socially with others. Numerous studies offer empirical support for integration of these core abilities. For example, Devany, Hayes, and Nelson (1986) demonstrated a correlation between language and equivalence when only the children in their research with no verbal skills failed to derive equivalence relations. Furthermore, the more severely language-disabled children also required more extensive training of the target conditional discriminations than the other children did, thus suggesting that prerequisite abilities in this regard were also deficient.

A subsequent replication of the study by Devany and colleagues (1986) provided further evidence of the importance of conditional discrimination abilities to equivalence and language. In research by Peláez, Gewirtz, Sanchez, and Mahabir (2000), nine normally developing infants, aged twenty-one to twenty-five months, were assessed on the Receptive-Expressive Emergent Language Scale (REEL-2) and then exposed to a series of visual-visual conditional discriminations. These involved matching animal-like figures presented in a match-to-sample (MTS) training format. There were four conditional discriminations: if A then B; if A then C; if D then E; and if D then F. Hence the trained relations were A-B, A-C, D-E, and D-F. All of the children readily demonstrated the target conditional discriminations and eight of the children demonstrated transitivity (B-C and E-F); however, five performed below chance on the symmetry tests (for example, B-A and F-D). As expected, there was a significant negative correlation between the number of conditional discrimination training trials and the learners' language quotient (in other words, higher language means less training). These findings highlighted the relationship between the level of explicit conditional discrimination training necessary for class formation and language competence, and they suggested some degree of distinction between the various component skills in equivalence.

A Protocol for Establishing Conditional Discriminations

In the relevant literature, there are few studies that have described the explicit training of conditional discriminations in very young learners. This most likely stems from difficulties in adapting existing methodological paradigms to this population, rather than weaknesses in the underlying concepts. Indeed, developing experimental methodologies for use with infants is always extremely challenging, but where they are available they may offer useful methodologies for training populations with severe developmental disabilities or delays. In one of the only existing studies, Peláez, Lubián, McIlvane, and Dube (2001) attempted to train and test conditional discriminations in infants who had not yet fully developed language. One child of eighteen months and two children of twenty-two months participated. The step-by-step protocol that comprised the training and testing of these skills is presented below, along with the procedural problems encountered and a sample data set. The protocol comprises six basic stages that guide instruction from simple touch-screen response training to generalized identity matching. These, along with an example of one trial from each stage, are presented in figure 4.1.

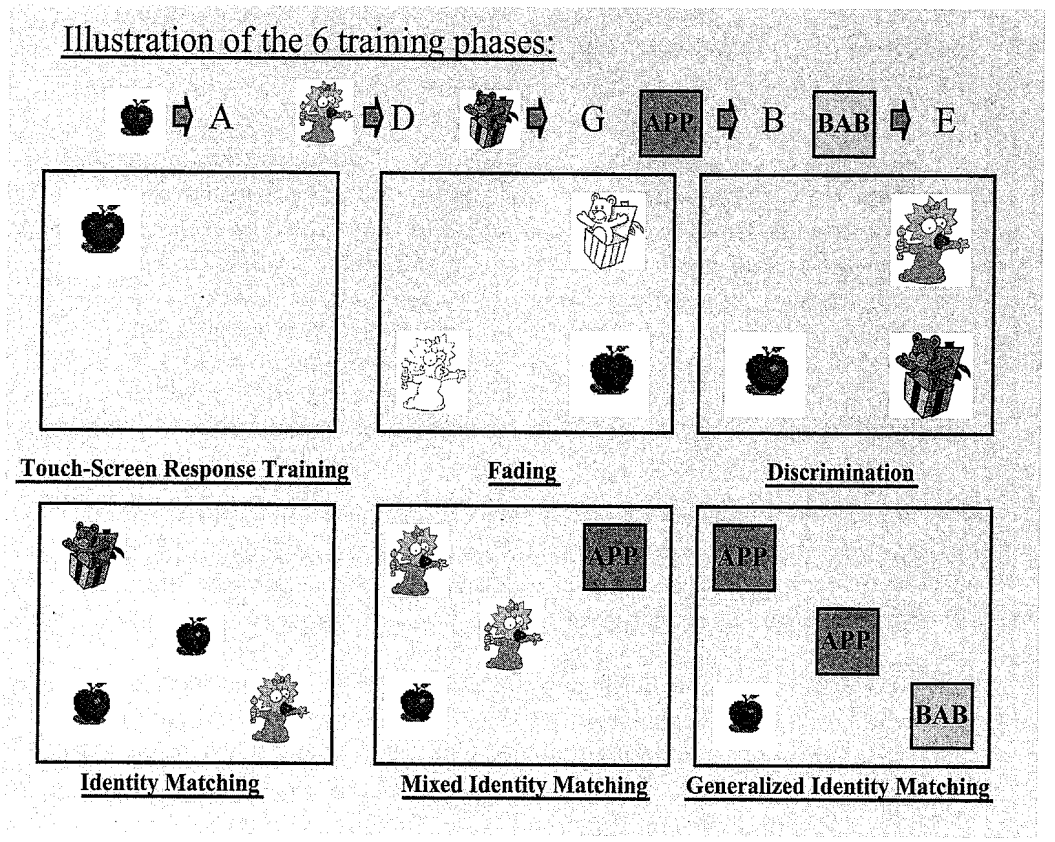


Figure 4.1. The discrimination training protocol reported by Peláez et al. (2001), with an example of each of the six stages.

Training Notes: Preparing to Start

Below are some notes and preparations for conditional discriminations training.

- Before you even begin, think very clearly about conducting training of this sort with very young or very developmentally disabled learners. On a good day, it can be frustrating. It is extremely difficult to adapt even the most articulate and systematic methodology to the attention spans of individuals from these categories, particularly with regard to appropriate responding and attaining a meaningful accuracy criterion. Also, it is very difficult to preserve their participation and that of their parents or assistants in a single-learner training environment. These are not small concerns. These matters raise important questions about the feasibility of any type of formal training with these learners. They also raise questions about how to interpret their performances, especially where the methodologies have been adapted from basic laboratory studies. For example, in

MTS training programs in which I have been involved, it is not uncommon to find that a learner appears to fail in one stage but then recovers or responds well in the next. Does that mean that appropriate responding in the first stage is present? Also, the prompting and cuing involved are usually more effective when the mother or teaching assistant is present, compared to when the learner is working with an unfamiliar adult. In light of these issues, one minimal benefit to be obtained from the current protocol is that it offers easy start-up training and confidence building with young learners who have some limited communicative and instructional histories.

- Ensure that training does not interrupt a regular episode involving sleeping, eating, or changing, because learner attention is frequently influenced by organismic conditions (such as fatigue or hunger).

- Try to make training sessions as short as possible. Fifteen minutes is the maximum for infants or severely disabled learners if you are to avoid distraction and fatigue. In my experience, sessions longer than thirty minutes can contribute to drastic changes and decline in responding.

- It is wise to test all reinforcers *prior to training.* There are numerous standard and simple procedures for doing this (see chapter 1 of this volume). One type of reinforcer available for automated procedures that has been found to be useful is the blinking of target stimuli and an accompanying musical sound (for example, for three seconds).

- Try to ensure that interventions are maximally effective by further enhancing the value of the chosen reinforcers to prevent satiation or habituation. Two ways to do this include alternating with other reinforcers (Higbee & Peláez-Nogueras, 1998) and ensuring that all reinforcers are short in duration. Social stimuli such as the caregiver's touch, smiles, and verbal praise have been shown to be very effective with young infants (Gewirtz & Peláez-Nogueras, 2000).

Training Notes: Presenting Trials

- Training is usually presented in blocks of ten trials. The mastery-training criterion typically consists of eight consecutive correct responses. However, with certain learners this criterion may still be too high, and it is feasible to adjust the criterion (at least early on) to seven consecutive correct responses. But remember that this is only two responses above half of all responses being wrong, so try to move back up to the higher (more stringent) criterion as soon as you can. Do not proceed to the next stage until the learner has attained this criterion.

- Where there are several comparison stimuli, their locations should be randomized across trials within a block. However, presenting more than two comparison stimuli in the teaching of conditional discriminations

does not work well with infants, although it usually works well with learners two years of age and older (see Augustson & Dougher, 1992).

- Reinforcement is provided contingently and immediately on *all* correct responses.
- Trials in which the learner makes an incorrect response are not reinforced.
- Additional interventions (such as shaping and task analyses) are usually necessary when learners fail to reach criterion after three consecutive blocks of the same type of trial (see also chapter 8 in this volume).
- Each training block is generally followed by a single block of five randomized probe trials (without feedback).
- Prompts can be used throughout all training trials. However, it is important to determine that the *reinforcers,* rather than the prompts, are controlling the learner's responses, so you must conduct subsequent training trials with no prompts, and responding should remain the same.
- Another important aspect to consider is whether the learner can name the target stimuli. When such a repertoire is not in place, more training trials are usually required (at least with MTS procedures). It may be useful (though not always an essential or required condition) to teach stimulus names prior to further training. Naming the objects may facilitate the matching (recognition of the object). See chapter 7 in this volume for further discussion and instructional strategies for establishing naming repertoires.
- Learners who fail to respond correctly on all five probes must start training again from the beginning.
- There are some reasons to believe that, for some learners, it may be more effective to conduct identity matching prior to (rather than after) discrimination training.

Training Notes: Identity Matching

The sequence of stages described below are taken from the research by Peláez and colleagues (2001) and should facilitate the training and testing of conditional discriminations in infants or other persons who have not yet fully developed language. The step-by-step protocol mentions procedural problems that may be encountered and a sample data set. The six basic stages guide instruction from simple touch-screen response training to generalized identity matching.

Stage 1: Touch-screen response training. This phase of training simply involves teaching the learner to touch a computer screen when a stimulus appears. Young children, learn faster when seated on their mother's lap. This is because the caregiver is helpful in

shaping the touch-screen response by modeling, prompting, and signaling appropriate responding. A familiar assistant may perform these functions for a learner who is severely disabled. Three stimuli that appear on the screen are directly trained: a picture of an apple (A), a picture of a baby (D), and a sketch of a bear in a box (G). Each stimulus is presented in a separate block of trials.

Stage 2: Fading. During this phase of training, comparison stimuli should be gradually faded in, so that each trial begins to more closely resemble the MTS format. That is, while A, D, or G appear, two comparison stimuli also gradually appear (fade in) until all three stimuli are clearly visible and the learner can select or point to the target stimulus. Pointing is reinforced by contingent stimulation (movement and sounds coming from the stimulus, while the mother or assistant also touches and praises the learner).

Stage 3: Discrimination training. During this stage, all stimuli should appear simultaneously on the screen and the learner must select the appropriate sample. Again, explicit training of A, D, and G remain in separate blocks.

Stage 4: Identity matching. During identity matching (also called *reflexivity training*), A, D, or G each appear individually as a sample with all three stimuli presented as comparisons. The learner is required to select the comparison that is an identity match with the sample (for example, A-A). Again, each target sample appears within a separate block of trials.

Stage 5: Mixed identity matching. During this stage, the sample stimuli are randomly presented within one block of trials. A novel B stimulus (for example, the word "apple") is also introduced as an alternative comparison.

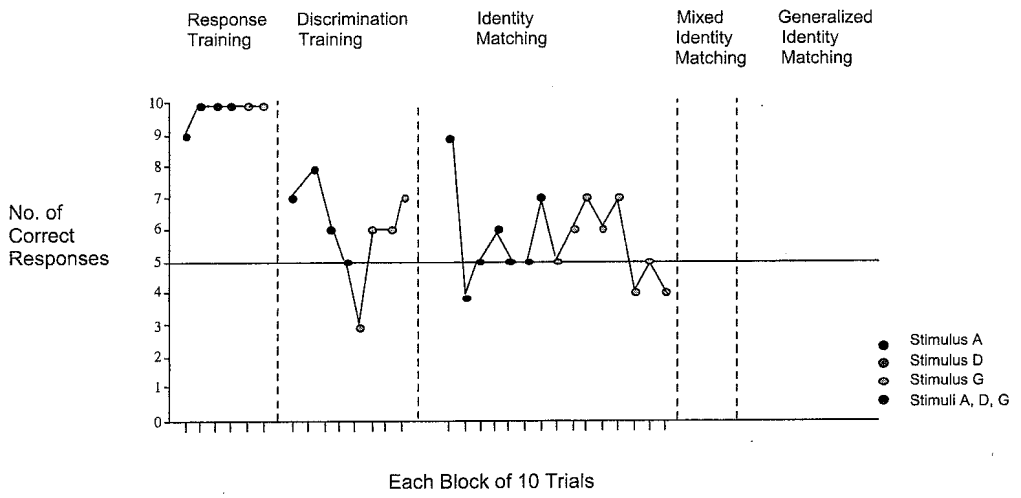
Stage 6: Generalized identity matching. This is a testing stage with no training. A series of novel stimuli (B, C, E, F, H, and I) appear as random samples within a block of twelve trials. Accurate identity matching of these stimuli (for example, B-B and H-H) is deemed evidence of generalized identity matching because none of these had previously been included during explicit reflexivity training.

Sample Training Results

In the research reported by Peláez et al. (2001), one child (a twenty-two-month-old male) readily reached criterion in the initial response training (thirty out of thirty correct responses) but failed to proceed through discrimination training. Specifically, across nine blocks of trials, his performance systematically deteriorated from seven out of ten to two out of ten, at which point the child was removed from the study. In this case, it was clear that difficulties resulted primarily from fatigue after a training session of longer than thirty minutes. Notably, this infant demonstrated a significant decline in responding during discrimination training with the introduction of each new stimulus, thus also suggesting possible habituation.

For illustrative purposes, the data from a second infant (eighteen months old) are presented in figure 4.2. This child required more extensive response training (sixty trials) to reach criterion. His performances during discrimination training began well (seven out

of ten) but then became erratic with the introduction of each new stimulus. However, he did eventually produce seven out of ten correct responses again. Training in identity matching was extensive but comprised relatively good performances for at least five blocks of trials. Nonetheless, performance toward the end declined, again suggesting habituation



and in this case a possible decline in reinforcer efficacy.

Figure 4.2. The data recorded with one learner at each stage of the protocol used by Peláez et al. (2001).

In summary, training conditional discriminations and training identity matching are critical precursors to language development, but they are difficult, and there is simply no easy way to make this happen. The protocol above has been used with some success with very young or very disabled learners, and common problems encountered in this context have been noted. The key is to ensure that the target skills can be generalized to novel stimuli, a capability that will be essential if the learner is to make the crucial transition between conditional discriminations and derived relations based upon them.

The Concept of Joint Attention

The current chapter offers a conceptual and functional distinction between joint attention and social referencing, with the view that the former is a necessary prerequisite for the development of the latter. Joint attention describes the capacity to use eye contact and cues to coordinate attention with another person in the sharing of an experience (such as an interesting object or event; Mundy, Sigman, & Kasari, 1994). Put simply, it comprises shared awareness of a stimulus. Joint attention begins to emerge between nine and twelve months of age and initially comprises of *gaze shifts* between a target object and a familiar person (Bakeman & Adamson, 1984). Consider a three-year-old girl and her mother visiting family friends. As the adults sit in the living room and chat, the girl plays with a puzzle on the floor. Suddenly, a kitten runs into the room and the little girl's

face lights up with surprise and pleasure. However, her next action is not to engage the kitten in play, but to look up at her mother's face while pointing to the kitten, to see if her mother had also witnessed the animal's dramatic entrance. Gaze shifts may subsequently be combined with gestures toward the object within the visual field of the familiar face.

Behavioral researchers (including myself) have proposed that an operant (rather than age-based) history guides the emergence of the skills of joint attention (Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004; Holth, 2005). Specifically, these behaviors normally result from environmental contingencies that operate during early mother-child verbal and gestural communications (Peláez, Gewirtz, & Wong, 2007). From this perspective, gaze shifts in joint attention incorporate (1) the selective effects of environmental stimuli that set the occasion for the response class, (2) stimuli that support joint attention behavioral chains in dual roles as discriminative and reinforcing stimuli, (3) the consequences that lead to the choice of experiencing a stimulus together with the adult versus experiencing it independently of the adult, and (4) relevant and plausible environmental conditioning histories. The analysis also identifies the function of reinforcers and suggests various classes of socially mediated stimuli that maintain joint attention behavior. Indeed, the most common function of the reinforcers appears to be face-to face interactions with an adult (Peláez-Nogueras, Field, Hossain, & Pickens, 1996). Put simply, reinforcers are initially produced by the activity related to the stimulus in question (for example, playing with a toy) and then increased by adult-generalized social reinforcers such as vocalizations and smiling, gestures of approval, or demonstrations of affection while engaged. In other words, it is often more reinforcing for a child to play with a toy or look at a book when the caregiver participates in the event than it is when the caregiver is absent.

Joint Attention Deficits in Autism

Interest in the concept of joint attention has increased because of its putative role in developmental disabilities (Carpenter, Pennington, & Rogers, 2002), and Dawson and colleagues (2004) have even argued that joint attention deficits alone can differentiate between normally developing learners and those with autism. Specifically, learners with autism appear to lack prerequisites for joint attention that include orienting to speech sounds and other social stimuli (for example, when someone points) and show more direct evidence of deficiencies in joint attention behaviors. For example, Charman and colleagues (1997) demonstrated that children with autism looked at a mechanical toy when it was activated but did not exhibit gaze switches between the toy and an adult who was present.

Deficits in joint attention have also been associated with abnormalities in language development (Mundy, Sigman, Ungerer, & Sherman, 1986). Specifically, in children with autism, correlations have been recorded between low frequencies of adult-object gaze switching at twenty months, limited language gains, and diminished social communication at forty-two months (Charman et al., 1997). One explanation for the relationship between language and joint attention suggests that the rapid vocabulary expansion of typical preschool development depends in part on the learner's ability to determine, via observation of adult-attending stimuli, which object in the immediate environment is related to the adult's speech.

According to this view, joint attention should warrant a potentially important place in early intervention programs, especially those aimed at establishing critical language prerequisites. And yet it is not often given such an important place in these programs. Indeed, despite its pivotal developmental significance, there are few effective interventions for ameliorating deficits in joint attention in the literature. The section below sets out a training sequence for this purpose that may be used with very young learners or those with developmental delay.

A Protocol for Establishing Joint Attention

The section below contains a description of the key components of a protocol for establishing joint attention, followed by empirical evidence to support the use of training regimes such as these in children with autism.

Establishing social reinforcers. The training of joint attention critically requires the existence of social stimuli, such as nods or smiles, as reinforcers at an early age. This can be accomplished with the teacher and learner sitting face-to-face, with ten edible reinforcers spread across the table between them. Block any attempts to remove the reinforcers from the table until the learner is sitting quietly; then nod and smile before allowing the learner to take one. It is important to emphasize that the learner is *only* allowed to take a reinforcer when the teacher nods and/or smiles (in order to make these gestures function as discriminative stimuli). In addition, you should emit an occasional verbal cue, such as "yes" or "Look at that" to further improve the learner's general communication skills.

Of course, this type of training may lead to the possibility that nods and smiles function as conditioned reinforcers *only* when treats are available but fail to do so in other situations. Naturally, this would mean that the learner may not recognize the nods and smiles of other adults in other contexts. But this situation seems unlikely, or at least relatively easily rectified.

Gaze following. When teaching a child the skill of gaze following, the teacher and learner should again sit at opposite ends of a small table. First, show the learner a reinforcer of choice, and then ask her to turn around while you place the reinforcer under one of two opaque cups. Then say, "ready," and allow her to turn around again to observe the cups. Ask her to point to the cup that she thinks contains the treat. Lift the chosen cup, and if the treat is there the learner can have it. If the empty cup has been selected, simply remove the treat and start again.

On a subsequent trial, place your face close to the cup with the treat while maintaining eye contact with the learner, such that she comes to rely on this cue for discriminating the cup that holds the treat. Continue with this type of training until the learner looks at your face and consistently chooses the cup with the treat. Next, across trials, fade out your proximity to the cup, so that eventually the learner can choose the right cup after only a brief glance on your part.

Learners such as those with developmental disorders may experience difficulty simply attending to others' faces. In this case, getting the learner to attend to your face, even when it is near the cup, will be difficult. In such a situation, it is possible to establish this skill by saying the learner's name, holding the treat up to your eyes, and then tracing

a visual path from your eyes to the treat as you place it under a cup. This can also be trained explicitly. This is to be repeated until the learner chooses the right cup.

Joint object attention. With joint object attention, the learner orients quickly or directly toward an object once another person's attention to the object has been discriminated. At best, the learner should also initiate your attention once a novel object has been identified. Consider the following scenario described by Jones, Carr, and Feeley (2006). Position a toy of choice less than five feet away from the learner, activate the toy, and turn and look at the learner while pointing to the toy and commenting upon it (for example, "Look at what the car is doing"). It should be possible to get the learner to orient toward the toy within as little as two seconds of your comment. Then, to improve initiation on behalf of the learner, have him attend to the toy for several seconds, and encourage him to point to the object while he looks at you. To reinforce this pointing response, you can simply model it or physically form the learner's hand to point at the object.

Mutual object orienting with gestures. Holth (2005) described the following steps for establishing mutual object orienting with gestures. Attach five or six envelopes to a wall in a horizontal line. In view of the learner, who is seated approximately ten to thirteen feet away from you, place an edible reinforcer in one of the envelopes. In order to access the snack, the learner must guide you through the envelopes. That is, you will begin by pointing to the envelope farthest away from the one containing the snack, and prompt the learner to guide you with simple directives such as "left" and "right," and "stop" when you reach the correct envelope. You can also arrange the envelopes in a vertical line and include prompts such as "up" and "down." Ultimately, you should be able to arrange the envelopes in a semirandom sequence (some side-by-side and others above and below) and all direct prompts to the learner should be faded. It is interesting to note some empirical evidence suggests that this type of intervention not only improves mutual orienting and gesturing, but is also associated with language gains (Jones et al., 2006).

Empirical Evidence

There is some empirical evidence to support the use of training regimes for the establishment of joint attention in children with autism. In one study, MacDonald and colleagues (2006) investigated joint attention initiations in twenty-one typically developing children (ages two to four) and twenty-six children with autism. As expected, the children with autism demonstrated relatively minor deficits in joint attention responding and more severe deficits in joint attention initiation. While the majority (78 percent) demonstrated gaze shifts, 44 percent demonstrated use of gestures, and only 22 percent were capable of related vocalizations. However, after one year of participation in a comprehensive treatment program, all of the children with autism demonstrated gaze shifts, all had gestures, 89 percent could vocalize, and levels of joint attention were now commensurate with the normally developing counterparts.

A study by McClannahan and Krantz (2006) also demonstrated the remediation of deficits in joint attention in three children with autism (ages two to five). In this research, photographic activity schedules were used to cue learners to play with toys in three locations a puppet theater, toy shelves, and a toy box. When learners initiated use of toys,

they were manually guided to point to the toy while orienting to the teacher. Across trials, manual prompts were faded (from graduated guidance to spatial fading and shadowing), and the teacher's proximity was decreased gradually. The results indicated that all three children learned to point and orient for attention and could do so with novel stimuli.

The Concept of Social Referencing

Although numerous authors integrate the concepts of joint attention and social referencing, the current chapter argues that they are distinct and that joint attention essentially precedes social referencing. Specifically, what social referencing *adds* to joint attention is that it also involves the learner reacting to the novel stimulus in a manner that is in accordance with the other's expression (Peláez-Nogueras & Gewirtz, 1997). Consider again the previous example of the three-year-old's surprise when the kitten runs into the room. As part of her joint attention skills, the child looks up at her mother while pointing to the kitten, but then she engages in social referencing when she sees her mother make a fearful face and as a result avoids approaching the kitten.

As well as incorporating the component of concordant responding (in other words, using the reactions of others as discriminative stimuli for one's own responding), social referencing also appears to comprise an emotional component. In other words, it extends beyond the simple sharing of information and also facilitates the learner's emotional reaction to stimuli. This emotional aspect of social referencing appears to make up a four-stage process that involves recognizing emotional expressions, understanding emotional expressions, responding to emotional expressions as cues, and altering behavior in accordance with changes in emotional expression.

Cognitive-developmental psychologists view the informational and emotional components of social referencing as separate processes. Specifically, they distinguish between *instrumental* social referencing, which involves the learner's use of knowledge from others as indicators of how to "understand" stimuli (Feinman, 1982), and *affective* social referencing, which involves the learner's use of others' emotional facial expressions to determine how to feel about ambiguous events (Klinnert, Campos, Sorce, Emde, & Svejda, 1983).

Learning theorists such as myself, however, have argued that both types of social referencing are outcomes of the same conditioning process, because the cues that convey affective components also contain instrumental information, and vice versa. The study by Gewirtz and Peláez-Nogueras (1992) provided some empirical support for this view, as well as examples of how the emotional aspects of social referencing can be explicitly trained.

In contexts of ambiguity, we identified two originally meaningless maternal facial expressions and then trained them with standard conditioning procedures to denote opposite consequences for responses where infants reached for objects. Hence, one maternal hand-to-face expression was trained to predict *positive* auditory-kinetic consequences of the infant reaching for ambiguous objects (see figure 4.3), while the other maternal hand-to-face expression was trained to predict *negative* auditory-kinetic consequences of the infant reaching for ambiguous objects (see figure 4.4).

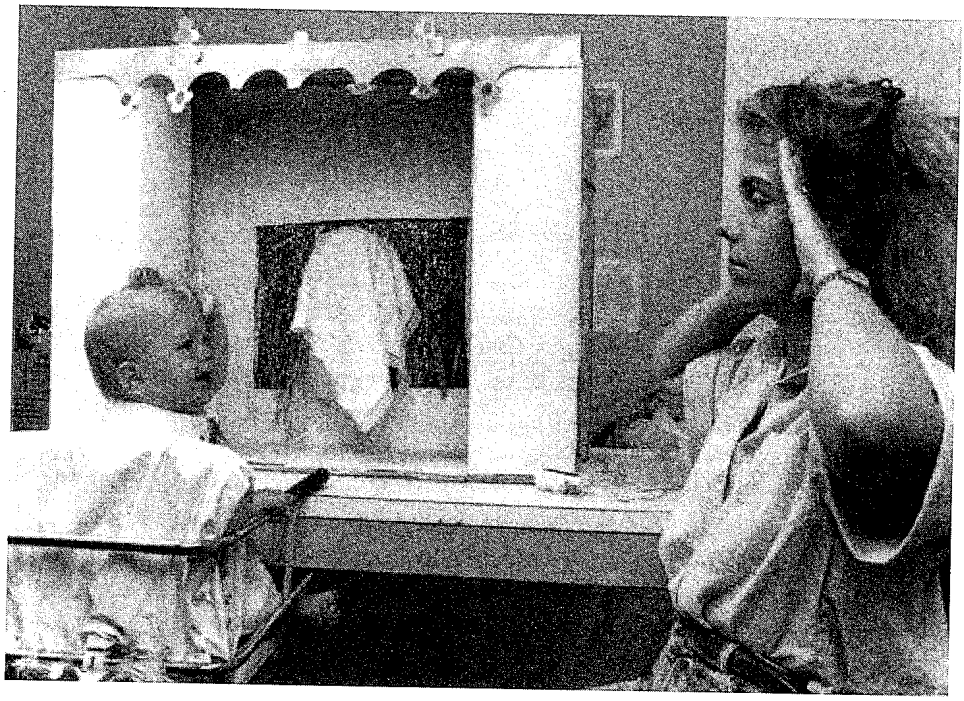


Figure 4.3. Mother signals joyful cue to infant that predicts pleasant musical sound, contingent on infant reaching for object.

Figure 4.4. Mother signals fearful cue to infant that predicts loud sound and movement of object, contingent on infant reaching for object.

What this research demonstrates is that the extent to which an infant orients to the mother's face for cues in contexts of uncertainty depends on past success in obtaining such information, its validity, and its utility. For training purposes, therefore, either with very young learners or with those who are developmentally disabled, the cues of others must be consistently contingent on the learner's object-referencing behavior and must reliably predict environmental consequences for the learner's approach or avoidance. This interpretation is summarized in Figure 4.5.

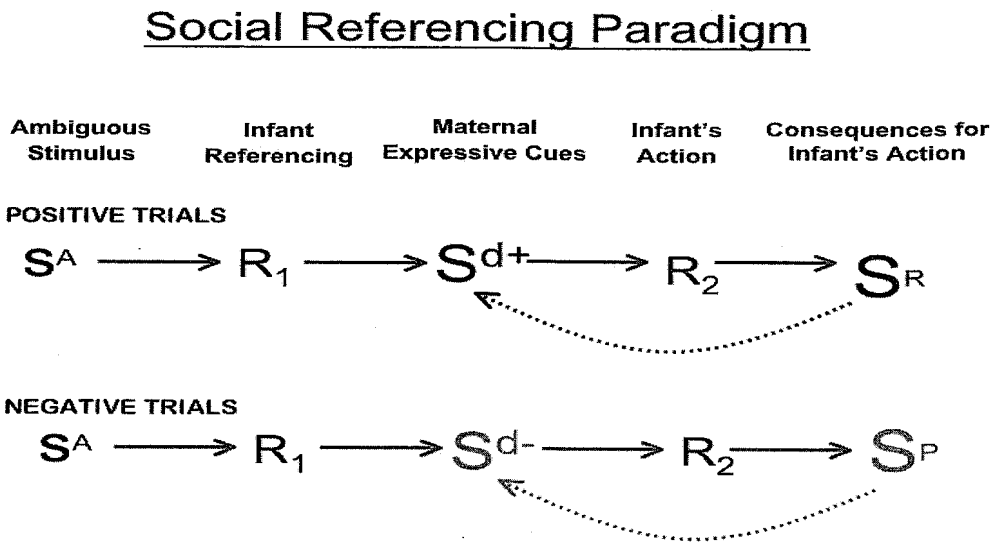


Figure 4.5. A learning approach to a social referencing paradigm.

From this perspective, social referencing is an example of social knowledge with an emotional component. Put simply, the experienced learner gains the knowledge that if another is smiling when a stranger approaches, reinforcement is likely; but if the other person is cringing, for example, reinforcement is not likely. Thus, the facial expression of the other becomes a setting event that establishes the function of the stranger as being discriminative for positive or negative reinforcement or aversive consequences for approaching. In line with this analysis, it should then be possible to establish learners' responses to the basic emotions displayed by others and how they should act on this basis. Once these have been established, it is likely that a whole array of more subtle emotional reactions and appropriate response patterns will be trainable within the context of simple conditioning paradigms.

Why Are Joint Attention and Social Referencing Important for Derived Relational Responding?

Joint attention and social referencing would seem to have an important role in the establishment of derived relational responding, thus forming the core of language and

higher cognition. For example, it seems likely that the emotional and social aspects of social referencing form the basis of the later development of perspective taking. That is, reciprocal conversation, cooperative play, and displays of sympathy and empathy for others are all social abilities that require the basics of joint attention and social referencing, because without them you would not use the ongoing cues of others to determine how they were feeling and to act accordingly. Hence, it is not surprising that individuals with autism who present with deficits in social referencing, for example, subsequently develop considerable delays in their social and emotional skills.

Concluding Comments

Joint attention and social referencing are an intricate part of the tapestry of social interactions that comprise normal development. Not only are they critical to the development of social and related emotional repertoires, but they also appear to be essential precursors to conditional discriminations and identity matching, which are also important precursors to language development and its core process of derived relational responding. The current chapter described teaching strategies for establishing conditional discriminations, joint attention, and social referencing in young and developmentally disabled learners. Despite the importance of these skills, such training is far from easy. But there is simply no way around this—if language and social and emotional development are desired and potentially within the capabilities of the learner, then the difficulties must be endured and the teacher must generate increasingly clever and creative ways to make the training work. Although empirical evidence in support of the various teaching strategies outlined is still scant, they offer good first steps toward the establishment of these essential building blocks of human development.

References

Augustson, K. G., & Dougher, M. J. (1992). Teaching conditional discrimination to young children. *Experimental Analysis of Human Behavior Bulletin, 9,* 21–24.

Bakeman, R., & Adamson, L. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interaction. *Child Development, 55,* 1278–1289.

Carpenter, M., Pennington, B. F., & Rogers, S. J. (2002). Interrelations among social-cognitive skills in young children with autism. *Journal of Autism and Developmental Disorders, 32,* 91–106.

Charman, T., Swettenham, J., Baron-Cohen, S., Cox, A., Baird, G., & Drew, A. (1997). Infants with autism: An investigation of empathy, pretend play, joint attention, and imitation. *Developmental Psychology, 33,* 781–789.

Dawson, G., Toth, K., Abbott, R., Osterling, J., Munson, J., Estes, A., et al. (2004). Early social attention impairments in autism: Social orienting, joint attention, and attention to distress. *Developmental Psychology, 40,* 271–283.

Devany, J. M., Hayes, S. C., & Nelson, R. O. (1986). Equivalence class formation in language-able and language-disabled children. *Journal of the Experimental Analysis of Behavior, 46,* 243–257.

Dube, W. V., MacDonald, P., Mansfield, R. C., Holcomb, W. L., & Ahearn, W. H. (2004). Toward a behavioral analysis of joint attention. *Behavior Analyst, 28,* 197–207.

Feinman, S. (1982). Social referencing in infancy. *Merrill Palmer Quarterly, 28,* 445–470.

Gewirtz, J. L., & Peláez-Nogueras, M. (1992). Infant social referencing as a learned process. In S. Feinman (Ed.), *Social referencing and the social construction of reality in infancy.* New York: Plenum.

Gewirtz, J. L., & Peláez-Nogueras, M. (2000). Infant emotions under the positive-reinforcer control of caregiver attention and touch. In J. C. Leslie & D. Blackman (Eds.), *Issues in experimental and applied analyses of human behavior.* Reno, NV: Context Press.

Higbee, T. S., & Peláez-Nogueras, M. (1998). Reinforcer identification in infants. *Behavioral Development Bulletin, 7,* 10–14.

Holth, P. (2005). An operant analysis of joint attention skills. *Journal of Early and Intensive Behavioral Interventions, 2,* 160–175.

Jones, E. A., Carr, E. G., & Feeley, K. M. (2006). Multiple effects of joint attention intervention for children with autism. *Behavior Modification, 30,* 782–834.

Klinnert, M., Campos, J. J., Sorce, J. F., Emde, R. N., & Svejda, M. (1983). Social referencing: Emotional expressions as behavior regulators in emotion. *Theory, Research, and Experience, 2,* 57–86.

MacDonald, R., Anderson, J., Dube, W. V., Geckeler, A., Green, G., Holcomb, W., et al. (2006). Behavioral assessment of joint attention: A methodological report. *Developmental Disabilities, 27,* 138–150.

McClannahan, L. E., & Krantz, P. J. (2006). *Teaching conversation to children with autism: Scripts and script fading.* Bethesda, MD: Woodbine House.

Mundy, P., Sigman, M., & Kasari, C. (1994). Joint attention, developmental level and symptom presentation in autism. *Development and Psychopathology, 6,* 389–401.

Mundy, P., Sigman, M. D., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism. The contribution of non-verbal communication measures. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 27,* 657–669.

Peláez, M., Gewirtz, J. L., Sanchez, A., & Mahabir, N. M. (2000). Exploring stimulus equivalence formation in infants. *Behavior Development Bulletin, 9,* 20–25.

Peláez, M., Gewirtz, J. L., & Wong, S. E. (2007). A critique of stage theories of human development: A pragmatic approach in social work. In B. A. Thyer (Ed.), *Comprehensive handbook of social work and social welfare: Vol. 2. Human behavior in the social environment.* New York: Wiley and Sons.

Peláez, M., Lubián, J., McIlvane, W., & Dube, W. (2001). *Training discrimination, reflexivity, mixed identity matching, generalized identity matching, and arbitrary matching in infants: Towards the "emergence" of stimulus equivalence.* Presented at the first international conference of the Association for Behavior Analysis, Venice, Italy.

Peláez-Nogueras, M., Field, T., Hossain, Z., & Pickens, J. (1996). Depressed mothers' touch increases infant positive affect and attention in still-face interactions. *Child Development, 67,* 1780–1792.

Peláez-Nogueras, M., & Gewirtz, J. (1997). The context of stimulus control in behavior analysis. In D. M. Baer & E. M. Pinkston (Eds.), *Environment and behavior.* Boulder, CO: Westview Press.