Teaching Children with Autism to Mand for Information

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ABSTRACT

In general terms a mand is a requesting response. Typically, children learn basic mands (e.g., "I want drink") before learning to mand for information. Across three experiments I taught children with autism to mand for information using the mands "What is it?," "Where?," and/or "Which?". In Experiment 1, a modified multiple-baseline design across situations was used to evaluate a teaching procedure that consisted of contrived motivating operations, prompt fading and prompt delay, natural consequences, error correction, and a brief preference assessment for teaching "What is it?" The results demonstrated strong internal validity with each of the three participants, with each showing generalization to situations, activities, scripts, the natural environment, and over time. In Experiment 2, a modified multiple-baseline design across three participants was used to evaluate approximately the same teaching procedure for teaching "Where?" The results demonstrated strong internal validity with each of the three participants, with generalization by all three participants to novel situations, activities, location the natural environment, and over time. In Experiment 3, a modified multiple-baseline design across three participants was used to evaluate approximately the same teaching procedure for teaching "Which?" The results demonstrated strong internal validity with generalization by all three participants to novel situations, activities, scripts, the natural environment, and over time. These findings are discussed in terms of its contributions to applied behaviour analysis research on teaching mand to children with autism.

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INTRODUCTION

Autism is a pervasive developmental disorder characterized by three impairments; social, communication, and restricted interests and behaviours (American Psychiatric Association, 2000). Language programs incorporating Skinner's (1957) analysis of verbal behaviour have been successful in increasing the language and communication skills of these children (e.g., Mudford, Ford, & Arnold-Saritepe, 2009). Skinner described six verbal operants. Each verbal operant has its own antecedent and consequence. Three of the verbal operants are the echoic, the tact, and the mand. Topographically, the echoic is a vocal imitation response. For example if a mother said to a child, "say please" and the child said "please" the child's response would be considered an echoic response. A tact is essentially a labelling response. For example if a child looked out a car window and said "choo choo train" as a train goes by this response would be considered a tact. A mand can be considered a requesting response. For example, if a child had not eaten in a long time and he said to his mother, "I want pizza", the child's response would be considered a mand (a functional description will be described later). This last example would be considered an example of a basic mand because the item that the child "wants" is evident and generally tangible. Children tend to learn basic mands before they learn more advanced mands. An advanced mand would be manding for information. An example of this type of mand would be when a child asks his mother "What's that?" These types of mands are considered advanced because the information requested is more abstract (not tangible), and advanced mands tend to be learned after some basic mands are learned. In this research, I investigated a procedure for teaching children with autism to mand for information using the mands; "What is it?", "Where?", and "Which?"

Autism and Applied Behaviour Analysis

Autism is a pervasive developmental disorder with three areas of impairment present before a child's third birthday (American Psychiatric Association, 2000). The first area of impairment is a social skill impairment. The child may fail to; (a) show appropriate nonverbal behaviour (e.g., body posture, eye contact, gestures) involved in social interactions, (b) develop age-appropriate peer relationships, (c) share his or her own enjoyments, interests, and accomplishments with others, and (d) show social or emotional reciprocity. The second area of impairment is a communication impairment. The child may have a delay in language or there may be an absence of language. For children who have language they may be unable to sustain or initiate conversations. Further, the child may engage in stereotypical and repetitive language, and there is an absence of age-appropriate socio-dramatic play. The third area of impairment is displaying stereotypical patterns of behaviour and/or showing restricted interest. The child may want to adhere to, or be inflexible with specific routines and rituals, he/she may display stereotyped and repetitive behaviours (e.g., hand or finger flapping), and he/she may be overly preoccupied with parts of objects (e.g., spinning the wheels of a toy car).

According to the Surgeon General of the United States intensive behavioural intervention is the only intervention to date that has been shown to be effective in increasing desirable behaviours for these children (e.g., language, play, and self-help skills) and decreasing undesirable behaviours (e.g., aggression, property destruction, self-injurious behaviour; Department of Health, 1999). More recently, The National Autism Center's National Standards Report (2009) has categorized treatments which incorporate behavioural strategies as effective treatments. Specifically they identify that "…treatments from the behavioral literature have the strongest research support at this time" (p.52). Recent meta-analyses have also indicated that

children receiving ABA make greater gains than those who do not (e.g., Eldevik et al., 2009; Virués-Ortega, 2010). An intensive intervention based on Applied Behaviour Analysis (ABA) generally consists of 30 to 40 hours of therapy a week, and as a result of its success some provinces in Canada currently fully or partially fund ABA programs for children with autism. Research on ABA with children with autism began in the 1960s and 1970s (Lovaas, 1966; Martin, 1975; Martin, England, Kaprowy, Kilgour, & Pilek, 1968; Martin & Pear, 1970; Wolf, Risley, & Mees, 1964). Lovaas and his colleagues were among the first to demonstrate that ABA was the treatment of choice for children with autism (Lovaas, 1981, 1987; McEachin, Smith, & Lovaas, 1993). Nearly half of the children in their study were able to attend mainstream schools without extra assistance. Despite the empirical evidence demonstrated by Lovaas and his colleagues as well as more recent partial replications (e.g., Birnbrauer & Leitch, 1993; Eikeseth, Smith, Jahr, & Eldevik, 2002; Fenske, Zalenski, Krantz, & McClannahan, 1985; Harris & Handleman, 2000; Weiss, 1999) some continue to be sceptical of the success of ABA, mainly due to the experimental design in the Lovaas study (Foxx, 1993; Gresham & MacMillan, 1997; Kazdin, 1993). Leaf and McEachin (2008) attempted to address the majority of the concerns about the Lovaas' 1987 study. For example they clarified that the 40-hours of therapy a week was only an average (range from 20-50 hours), one-to-one teaching was not the only method used and small group teaching also occurred, and teaching did not occur exclusively at home.

ABA interventions use a variety of behavioural principles and procedures such as reinforcement, extinction, fading, shaping, and chaining (for a review of these principles and procedures see Martin & Pear, 2007) when teaching new behaviours. These principles and procedures are used to teach new skills to children by breaking them down into small components and gradually building on them as they become progressively more difficult. ABA

interventions are more successful if they: (a) are intensive, providing more than 30 hours per week of intervention for at least 2 years, (b) are supervised by qualified professionals, (c) is incorporated into the natural environment, (c) include comprehensive programming covering all areas of deficits, and (d) include parental involvement (Hayword, Gale, & Eikeseth, 2009)

As mentioned previously one of the deficits of children with autism is a language deficit. One method that has been used by behaviour therapists to teach language to these children is based on Skinner's (1957) analysis of verbal behaviour.

Skinner's Analysis of Verbal Behaviour

B.F Skinner (1957) examined language and its development from a behavioural perspective. Skinner wrote, "in defining verbal behaviour as behaviour reinforced through the mediation of other persons we do not, and cannot, specify any one form, mode, or medium. Any movement capable of affecting another organism may be verbal" (p.14). For instance Skinner clarified that verbal behaviour includes both vocal (speaking) and gestural responses (e.g., pointing) and occurs because of the interaction between a speaker and listener. Every speaker is said to have a verbal repertoire.

He described that an individual's verbal repertoire is comprised of six verbal operants. Like all operant behaviours, verbal operants are influenced by their consequences. One of the most important verbal operants according to Skinner (1957) is the tact. According to Skinner, a tact is "defined as a verbal operant in which a response of a given form is evoked (or at least strengthened) by a particular object or event or property of an object or event" (p.81-82). Some may say that a tact is a labelling response. The tact is preceded by a discriminative stimulus and is typically reinforced by conditioned generalized reinforcers.

According to Skinner (1957), there are three verbal operants that are under the control of prior verbal stimuli. These verbal operants are echoics, textuals, and intraverbals. An echoic is a verbal operant that has a point-to-point correspondence with its verbal stimulus. The consequences following an echoic response are typically conditioned generalized reinforcers. A textual behaviour also has a point-to-point correspondence with the verbal stimulus that precedes it, that is, the response made by the speaker is directly linked to the verbal stimuli that preceded it. A speaker demonstrates textual behaviour by reading. The intraverbal is the only verbal operant of the three that does not have a point-to-point correspondence with the verbal stimulus that precedes it. Skinner indicated that with the intraverbal response, the verbal stimulus and response may be either vocal or written. An example of an intraverbal response is if one says "Ready, set, …." another person will likely say "Go".

The fifth verbal operant is transcription, which is motor behaviour rather than vocal behaviour. Examples of transcription behaviours are; writing, copying, and drawing.

Lastly, the mand is the only verbal operant that specifies its consequence. For example if a person mands for "water", water is the consequence or the reinforcer for this mand. Skinner (1957) stated that the mand is also the only verbal operant that is controlled by states such as deprivation or satiation. Over the years the term used to refer to this motivational antecedent has changed.

<center>*A Behavioural Approach to the Concept of Motivation*</center>

The current behavioural approach to motivation began with a series of articles by Michael (1982, 1988, 1993). Since these initial papers, behaviourists have placed more of an emphasis on motivation in various textbooks and articles. Further, since the appearance of these initial papers the motivational terms have been modified to better capture all the effects of

motivation (Laraway, Snycerski, Michael, & Poling, 2003; Martin & Pear, 2007). I will review

the current terminology of a behavioural approach to motivation to the extent that is relevant to

my present research (for a historical review see Sundberg, 2004).

Currently the term motivation is now referred to as motivating operation (MO) by

behaviourists. MOs are events or operations that (a) temporarily alter the effectiveness of a

consequence as a reinforcer or punisher (a value-altering effect) and (b) influence behaviours

that normally lead to those reinforcers or punishers (behaviour-altering effect; Laraway et al.,

2003). For instance, if you have not eaten for a long period of time, food will more likely act as a

reinforcer (value-altering effect) and being food deprived will lead to engaging in behaviours to

get food (behaviour-altering effect). Motivating operations can be unconditioned or conditioned.

The unconditioned motivating operation (UMO) has a value-altering effect that is unlearned and

the behaviour-altering effect is learned. Food deprivation is an example of a UMO. In other

words you did not need to learn that food deprivation increases the effectiveness of food as a

reinforcer, however you have learned how to engage in different behaviours to get food (e.g., ask

someone, go to the store, open the fridge, find a vending machine, go to a restaurant). The

conditioned motivating operation (CMO) has a value-altering effect and a behaviour-altering

effect that are learned. For example, a child is trying to complete a puzzle, however a puzzle

piece is missing. This CMEO increases the effectiveness of the puzzle piece as a reinforcer

(value-altering effect), and it will increase behaviours that have been successful in finding the

puzzle piece in the past (e.g., asking someone for help, looking in the box, looking around the

room). Both of the above-examples are examples of motivating establishing operations (MEOs)

for reinforcers. In other words, in both instances the value-altering effect increases the value of a

reinforcer (establishing effect) and it increases behaviours that will lead to accessing reinforcers

(evocative effect). Specifically, the food deprivation is an example of an unconditioned motivating establishing operation (UMEO), and the missing puzzle piece is an example of a conditioned motivating establishing operation (CMEO). Identifying motivating operations has been determined to be important in assessing and treating challenging behaviour (e.g., Carr, LeBlanc, & Love, 2008; Hagopian, Kuhn, Long, & Rush, 2005) as well as increasing manding skills (e.g., Langthorne & McGill, 2009; Sundberg & Michael, 2001).

There are however instances of MOs where the value of a reinforcer and behaviours leading to that reinforcer will decrease. This type of motivation is called motivating abolishing operations (MAO). For MAOs the value-altering effect decreases the effectiveness of reinforcers (abolishing effect) and it decreases behaviours (abative effect) that lead to accessing those reinforcers. Like MEOS, MAOs can be unconditioned (UMAO) or conditioned (CMAO). For instance after you have just finished eating a very large meal (UMAO), food will be less likely to act as a reinforcer (abolishing effect) and will decrease (abative effect) behaviours that will lead to accessing food. In the case of a CMAO, if a you have just spent 6 hours watching TV, the TV will be less likely to serve as a reinforcer (abolishing effect) and you will be less likely to engage in behaviours (abative effect) that will lead to getting to watch TV. For a summary of the terms, abbreviations, and their effects, see Table 1. So far, examples have been given with motivation involving reinforcers. Motivation can also involve punishers. Like motivation for reinforcers, motivation for punishers has two effects; a value-altering effect and a behaviour-altering effect. For example, a temperature below freezing when you go outside in the winter will increase the value of cold as a punisher and will also decrease behaviours that are associated with being cold (UMEO). MOs for punishers will not be discussed further in this section given that the present research examined CMEOs for reinforcers.

Table 1.

Summary of Motivational Operations for Reinforcers

Term	Abbreviation	Value-Altering Effect	Behaviour Altering Effect
Motivational Operations (two types; MEO & MAO)	MO	Establishing or abolishing	Evocative or Abative
Unconditioned Motivating Operations (two types; the UMEO and the UMAO)	UMO	Establishing or Abolishing (unlearned)	Evocative or Abative (learned)
Conditioned Motivating Operations two types; CMEO & CMAO)	CMO	Establishing or Abolishing (learned)	Evocative or Abative (learned)
Unconditioned Motivating Establishing Operations	UMEO	Establishes (unlearned)	Evocative (learned)
Unconditioned Motivating Abolishing Operations	UMAO	Abolishes (unlearned)	Abative (learned)
Conditioned Motivating Establishing Operations	CMEO	Establishes (learned)	Evocative (learned)
Conditioned Motivating Abolishing Operations	CMAO	Abolishes (learned)	Abative (learned)

Note: The value altering effect has either of two sub-effects; it establishes (increases the value) or abolishes (decreases the value). The behaviour altering effect has either of two sub-effects; it is evocative (increases behaviours) or abative (decreases behaviours). For more information on the new terminology and their effects as well as empirical examples, please see Laraway et al. (2003)

CMEOs versus S^D^s

Skinner (1957) indicated that the distinctions between the mand and other verbal operants are their antecedents and their consequences. While the antecedent to the mand is the motivating operation, the antecedent to other verbal operants is a discriminative stimulus (S^D). This is one example of why the distinction between the S^D and the CMEO is important. In his first article on the topic of motivation, Michael (1982, 1988) began to make the distinction between the motivating operation and the S^D[1]. An S^D is a stimulus that indicates that a reinforcer is available following an instance of behaviour. Some would say that an "… S^D is a cue that tells you what to do to get what you already want" (Martin & Pear, 2007, p.245). For instance during a language teaching program, a child is asked "What's this?" when shown a picture of a flower. The question "What's this?" and the picture are S^{Ds} that when the behaviour of naming the item is evoked it will lead to receiving the available reinforcer (e.g., a token). A CMEO on the other hand increases the effectiveness of a reinforcer and increases the frequency of behaviours associated with obtaining that reinforcer. Some would say that a CMEO "… is a cue that changes what you want and tells you what to do to get whatever it is that you now want" (Martin & Pear, 2007, p.245). For instance, a child is doing a puzzle (preferred activity) and there is a piece missing. This CMEO will increase the likelihood that that the puzzle piece will serve as a reinforcer and it will also increase behaviours that are associated with obtaining that piece (e.g., asking, searching). Michael (1982) makes the following further distinctions between the S^D and the CMEO; (a) an S^D is "…. correlated with a higher frequency of reinforcement" (p.152) whereas a CMEO "…. changes what functions as a reinforcement" (p.152), (b) an S^D indicates that a reinforcer is available whereas a

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[1] Although his articles uses the term establishing operation, given the more recently accepted term of conditioned motivating establishing operation, this term will be used in this section instead.

CMEO increases the effectiveness of a reinforcer, and (c) the frequency of behaviours evoked by the S^D is not generally altered whereas with the CMEO the frequency of behaviours associated with obtaining a particular reinforcer is altered.

Some Considerations for Applying Skinner's Analysis of Verbal Behaviour

As Skinner (1957) pointed out, his book is not based on empirical literature or statistical analyses. It is therefore up to researchers to validate the assumptions made by Skinner. One of Skinner's assumptions is that verbal operants can be multiply controlled. For instance, variables that control both tacts and mands may be present when the learner emits a response (this will be discussed later). A second assumption is that verbal operants are functionally independent from each other. In other words even though a child can tact "juice" he may not be able to mand for "juice". A third assumption is that one verbal operant can be used to teach another verbal operant. For example, if a child is able to tact "juice", then during mand teaching, the presence of a glass of juice can be used as a prompt for the child to mand for "juice"[2].

Multiple Variables that Control a Single Verbal Operant

There are two variables that distinguish a tact from a mand; the antecedent and the consequence. A discriminative stimulus precedes a tact whereas an MO precedes a mand. In addition, the consequence following a tact is typically a conditioned generalized reinforcer, whereas the consequence following a mand is the item it specifies. Failure to make this distinction is considered to be a difficulty in understanding Skinner's (1957) analysis of verbal behaviour (Stafford, Sundberg, & Braam, 1988). In order to better determine the verbal operant that one is measuring or assessing, it is important to identify the variables that control each of these verbal

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[2] For a brief review on Skinner's verbal operants and the teaching of language skills to children with autism see Sundberg and Michael (2001).

operants (e.g., stimuli, antecedents, consequences). However, Skinner noted that there are many

instances where there are multiple variables that control a verbal response. For instance, if a child

says "juice" in the presence of a glass of juice and when having been deprived of fluids for a long

period of time, the word "juice" cannot be seen as a pure tact, nor can it be seen as a pure mand,

given that multiple variables that control both the tact and the mand are present. He therefore

would term these verbal responses as impure mands and impure tacts. Several studies discuss the

teaching or assessing of impure verbal operants (e.g., Drash, High, & Tudor, 1999; Nuzzolo-

Gomez & Greer, 2004; Twyman, 1996).

Functional Independence of Verbal Operants

As stated previously, Skinner (1957) assumed that the verbal operants are functionally

independent. In other words learning one verbal operant does not guarantee that an individual will

emit a different verbal operant. The rational behind this is that each verbal operant has different

antecedent and consequence stimulus control (Mudford et al., 2009). Lamarre and Holland (1985)

demonstrated the functional independence of verbal operants among typical children. In their

study one group of children learned to tact the placement of an item ("on the left" or "on the

right") and another group of children learned to mand for an item to be placed "on the left" or "on

the right". Their results supported Skinner's assumption in that the group that learned to mand

could not emit tacts for the same response and the group that learned to tact could not emit mands

for the same response. The independence of mands and tacts was also supported in a study with

children with language delays (Twyman, 1996) and autism (Nuzzolo-Gomez & Greer, 2004).

However, some studies have shown that mands emerge after typically developing children

(Petursdottir, Carr, & Michael, 2005) and adults with severe intellectual disabilities (Sigafoos,

Reichle, Doss, Hall, & Pettitt, 1990) were taught to tact. In the latter two studies, the history of the

participants for learning various verbal operants may have been different than in the initial two

studies. Recently Egan and Barnes-Holmes (2009) replicated the Nuzzolo-Gomez and Greer study and found the same results. Egan and Barnes-Holmes taught four children with autism to mand for an item in one of three bowls (small, medium, and large). A tact assessment was conducted immediately after the participant had met the mastery criterion for the mands. The tact assessment consisted of pointing to one of the bowls and the participants were required to say "It is a (size) bowl". Tacts did not emerge following mand teaching. Four weeks following this assessment, a modified tact assessment was conducted. This time the researchers pointed to the bowl and said "What is it?" Three of the four participants were then able to tact the bowls. The researchers concluded that it is possible that it is the unclear antecedent condition that prevented the emergence of the tacts following mand training, rather than the functional independence of the two verbal operants. It was noted that since a vocal stimulus was present before the response, it was not pure verbal operants but impure verbal operants that emerged. The results of this study are preliminary and warrant further replication.

Using One Verbal Operant to Teach Another Verbal Operant

As indicated previously, Skinner (1957) noted that one verbal operant can be used to teach another. Several researchers have validated this assumption (e.g., Braam & Sundberg, 1991; Carroll & Hesse, 1987; Drash et al., 1999; Hall & Sundberg, 1987; Wallace, Iwata, & Hanley, 2006). I will review studies that are relevant to mand teaching in the next section.

Teaching Individuals with Autism and Developmental Disabilities to Mand

Basic mands are those in language development that occur first. For example an infant who says "baba" to receive his bottle, would be emitting a basic mand. The antecedent to the basic mand is an MO and the consequence is the item that it specifies. Mands for information on the other hand are more advanced mands. They are mands that begin to emerge in the toddler and preschool years. Topographically these mand can consist of questions such as "What?", "Where?"

and "Why?". Like basic mands the antecedent to the mand for information is an MO, the consequence however is the answer to the question.

Basic mands are viewed by some to be one of the most important verbal operants to teach to children with autism (Sundberg & Michael, 2001) and should be the first one that an individual learns (Drash et al., 1999). Sundberg and Michael affirm that language teaching programs should place a large emphasis on teaching basic mands. Mand teaching they say is generally neglected in language teaching programs in favour of auditory-visual and tact teaching. However, they state that teaching basic mands is beneficial for a learner because: (a) learning mands gives the learner more control over the environment and the delivery of the reinforcers, (b) once some mands are learned they can make a teaching session more successful, and (c) mands can be used to teach other verbal operants such as echoics, tacts, and intraverbals. Further, teaching mands provides an individual a socially acceptable way to communicate (Drasgow, Sigafoos, Halle, & Martin, 2009). As Skinner (1957) noted the antecedent that precedes the mand is very important. This antecedent, now called an MO (Laraway et al., 2003), is often neglected in mand teaching programs despite evidence that supports that its presence is necessary when teaching mands (Sundberg, Loeb, Hale, & Eigenheer, 2002; Sundberg & Michael). The following are guidelines to increase the likelihood that MEOS are present during mand teaching: (a) properly contriving CMEOs increases the probability that you are teaching mands and not another verbal operant, (b) watch for behavioural indicators that provide a cue to the listener that it is time to prompt (e.g., if a child begins to search for a missing item, the searching is a behavioural indicator that a prompt should be given for the child to mand "Where?"), and (c) contrive MEOs during naturally occurring routines (e.g., a child's shoes are missing when the child is getting ready to go outside; Drasgow et al.). In the next two sections I will review the teaching of basic mands (i.e., requesting a specific item) and mands for information.

Teaching Basic Mands

When teaching mands, MOs can be captured or contrived. Captured MOs are those that naturally occur in the environment (Shafer, 1994). Captured MOs to teach mands could also be referred to as the naturalistic behavioural approach. Teaching using this approach occurs in the natural environment and begins when a child initiates interest in something. Prompts are then given to teach a target response and reinforcement is used to increase the likelihood that the response will occur again in similar future situations. The type of reinforcement used in this type of teaching is the activity or item that the child has shown interest in (e.g., Ingersoll, 2010). One of the earliest studies to demonstrate the effectiveness of a natural behavioural approach was done by Hart and Risley (1968). They successfully increased adjective-noun use in culturally deprived children within a pre-school classroom. Children were required to use adjective-noun combinations when they wanted something before they could access that item. For example, when a child approached an item that they wanted during free play, the teacher would put her hand on the item and the child had to request it using a colour-noun combination (e.g., "I want the red paint"). Upon making this request the child was able to get the item he/she requested. Hart and Risley established a CMEO and taught mands by using preferred items that the child "wanted" (determined by his/her approaching response) and blocking access until a mand occurred, and then giving access to the requested item. Hart and Risley's study was one of the first to demonstrate that the use of preferred items and consequences specified by the mand was effective in teaching mands. More recently, researchers have also found that using preferred items (Halle, Marshall, & Spradlin, 1979; Hartman & Klatt, 2005; Tada & Kato, 2005) and deprivation (e.g., Halle et al. ; Hartman & Klatt) to teach mands increases the speed of acquisition and helps ensure the presence of an MO.

Mands can also be taught by contriving MOs. MOs can be contrived by purposely manipulating or making changes to the environment. The advantage of contrived MOs is that it: (a) allow for more control when teaching mands and increases the potential to capture the MO, (b) allows for a variety of mands to be taught by increasing the reinforcing value of various items, and (c) reduces the possibility that impure mands are taught, as when using captured MOs items are typically in sight (impure tact) and a discriminative stimulus may also be used (impure intraverbal, Schafer, 1994). Hall and Sundberg (1987) taught individuals with hearing impairments and severe intellectual disabilities to mand by contriving MOs. The individuals first were taught to follow a behavioural chain in order to complete a task. Once the individuals could successfully complete the task, they were presented with the same task, however one item was missing. Two prompts were compared; a tact prompt where the missing item was shown to the individual and an imitative prompt where the experimenter signed the correct response. Results indicated that both prompting techniques were successful in teaching these individuals to mand for the missing items. In a second study (Wallace et al., 2006) three adults with intellectual disabilities were taught to tact preferred and non-preferred items. Once tacts had successfully been acquired, shaping the tact into a mand began. That is, when the individuals emitted a tact they were given access to the item. Their response now became an impure mand. Eventually mands for the non-preferred item ceased whereas mands for the high-preferred item increased.

Verbal behaviour does not necessarily mean vocal behaviour. Skinner (1957) indicated that mands can take many forms including behaviours such as gestures like pointing. Individuals with autism and other developmental disabilities were successful in learning to mand via a Picture-Exchange Communication System (PECS). This procedure essentially consists of teaching individuals to exchange pictures for desired items (Bondy & Frost, 1993). More recently researchers manipulated two conditions to determine whether an MO was present when

individuals used PECS (Gutierrez et al., 2007). Three of the four participants manded in the presence of an MO.

My research incorporated the findings from the above research and other research on basic mands by contriving CMEOs during teaching. This was done by using preferred activities (e.g., Halle et al., 1979; Hartman & Klatt, 2005; Tada & Kato, 2005; Wallace et al., 2006), and depriving (e.g., Halle et al.; Hartman & Klatt) the children from these activities for at least 24 hours.

Teaching Mands for Information

When teaching mands for information the instructor is essentially teaching a learner to ask a question. Mands for information are preceded by an MO (antecedent) and are reinforced by the information given. Sundberg and Michael (2001) indicated that "[q]uestions are important for verbal development because they allow a speaker to react more precisely to the environment and to acquire additional verbal behavior" (p.711). Teaching children to mand for information can help with increasing social interaction, learning advanced language skills, increasing vocabulary, and increasing communication (Betz, Higbee, & Pollard, 2010). Researchers have found that when mands for information are taught, new responses and behaviours can emerge (e.g., Ingvarsson & Hollobaugh, 2010; Taylor & Harris, 1995). For example, Ingvarsson and Hollobaugh found that when children with autism were taught to say "I don't know, please tell me", following an unknown intraverbal question, for most of the children, simply answering their mand (i.e., giving the answer to the intraverbal question) and requiring the child to repeat the answer, increased their correct responding to what had been shown to be previously unknown questions. Despite the importance of the presence of the MO during mand teaching, Sundberg and Michael state that teaching mands for information to children with autism is often difficult because children with autism are not frequently reinforced by verbal information.

Teaching "What?"

Once an individual has learned basic mands, the next step would be to teach them to mand for information. The first mand for information to emerge in young preschool children is "What's that?" (Brown, 1968). One of the first studies to investigate teaching a child to mand for information was a study by Twardosz and Baer (1973). They asked two adolescent boys with severe intellectual disabilities to tact several different letters, then they inserted a blank card in the array and upon seeing the blank card the boys were taught to say "What letter?" Correct mands resulted in tokens, praise, and the answer to their question. The results indicated that both boys were able to ask "What letter?" in the presence of a blank card. Upon assessing for generalization with colours and numbers, the boys asked "What letter?" when shown a blank card. The experimenters further investigated whether giving praise and tokens prior to responding would influence the participants' response levels. They found that responding dropped to near zero levels. Sundberg et al. (2002) explained these unfortunate findings by stating that the response was not a mand but was a tact as it was consequated by programmed reinforcers (i.e., praise and tokens) rather than the only reinforcer related to the mand (i.e., the answer to the question).

In a similar study, Taylor and Harris (1995) were successful in teaching children with autism to ask "What's that?" when presented with unknown objects. Conditioned generalized reinforcers (praise and access to the item) were delivered following the mand. Mands were also reinforced with the answer to their question (i.e., the names of the items). They found that the children who acquired the names of the unknown items were able to generalize their skill to a less structured environment (e.g., going for a walk in the school). Similarly, Warren, Baxter, Anderson, Marshall, and Baer (1981) assessed whether 8 individuals with severe to profound intellectual disabilities who had previously learned to mand "What's that?" in the presence of unknown items retained their skill three months later. They found that two of the individuals were able to mand

"What's that?" without further teaching, while two individuals were able to mand "What's that?" after peer modeling, and the other four individuals required direct teaching in order to be able to mand "What's that?" Although the actual teaching procedure only stated that modelling and contingent reinforcement were delivered, it is unknown whether the contingent reinforcement was a conditioned generalized reinforcer. If it was, then this may be one of the reasons why generalization over time did not occur (Sundberg et al., 2002).

More recently Roy-Wsiaki, Marion, Martin, and Yu (in press) taught one child with autism to request using the mand "What?", during a teaching procedure consisting of a contrived CMEOs, prompt delay and prompt fading, error correction, and natural consequences as the reinforcer. The child learned to mand "What?" across four different CMEOs. In what the researchers called the *hide-and-seek* CMEO a preferred toy was hidden from the child on every trial. In the *missing item* CMEO, an item needed to complete the activity was missing for every trial. In the *requiring more* CMEO, more of something was needed to complete the activity for every trial. In the *surprise* CMEO the experimenter told the child that she had something for him. The researcher used activities/toys within each CMEO. Activities helped to set up opportunities for the child to mand and consisted of things that the child and experimenter did together within each CMEO. For instance in *hide-and-seek*, the child and experimenter played with some toys and the toy the child seemed to prefer was hidden. Once the toy was hidden the experimenter said one of two scripts (e.g., "I hid something"). Once the script was said the child was then prompted to say "What?" If the child said "What?" the answer to his question was given (e.g., "the train") and he was given the item. The other three CMEOs (*missing item*, *requiring more*, and *surprise*) were conducted in a similar fashion. Upon teaching the child to mand "What?" in the first three CMEOs, generalization to the last CMEO (*surprise*) occurred, and generalization to untrained scripts and a novel activity also occurred. Most importantly segments of downtime were videotaped prior to the

commencement of teaching and after mastery of the mand in each of the CMEOs. The researcher

found that the spontaneous request "What?" in the natural environment increased after the mastery

of the mand in each CMEO, providing evidence that CMEOs were correctly contrived in teaching,

and that the scripts were not functioning as S^{Ds}.

Teaching Other Mands for Information

Research using videos as prompting strategies have been shown to be effective in teaching

children to mand for information (e.g., Charlop & Milstein, 1989; Knapczyk, 1989). In attempts to

teach a student to mand for information during a math class, the student watched a video of a math

lesson and learned to stop the video to ask questions. Results indicated that this skill further

generalized to the classroom environment. Unfortunately the authors failed to mention the specific

mands that the student was emitting (Knapczyk). In a second study, video modelling was used to

teach children with autism to request information during short conversational exchanges about

preferred topics. The children were taught a variety of different mands including; "Is?"; "Can?";

"Do?"; "How?"; "What?"; and "Are?". Although the procedure used conditioned generalized

reinforcers (i.e., praise and small edible item), the children's question asking increased and was

maintained and generalized to new conversations (Charlop & Milstein).

Williams, Donley, and Keller (2000) taught young preschool children with autism three

different mands. First the children were shown a box and an echoic prompt was delivered for the

children to ask "What's that?" Upon correctly emitting the mand the children were told the name

of the item and got access to the item. Second, once the children successfully manded "What's

that?" they were told what was in the box and prompted to say "Can I see it?" If the children

successfully used both mands their mands were reinforced by getting access to what was inside the

box. The final step was to teach these children to mand "Can I have it?" Only upon correctly

emitting this response (as well as the other previously learned mands) the children were given

access to the item inside the box. This study demonstrated that when an MO was present and the

consequence specified by the mand was delivered, a variety of different mands were taught and

generalized to novel persons and over time (Sundberg et al., 2002).

   Sundberg et al. (2002) extended the findings of Williams et al. (2000) by teaching two

children with autism to mand for information using the target words "Where?" and "Who?" In the

first of two experiments the children were given access to preferred or neutral items. After a brief

distraction the children were asked to "Go get ____", and prompted to ask "Where is _____?"

Results indicated that one child acquired the mand more readily with the preferred item and the

results were the reverse for the second child. The first child was successful in manding "Where is

_____?" for a novel preferred item, however was not observed to spontaneously mand "Where is

____?" outside of the teaching environment. The second child was unsuccessful during the

generalization assessment, however was heard by his parents to spontaneously mand "Where is

_____?" In the second experiment one of the children from the first experiment as well as a new

participant were taught to ask "Who has it?" after successfully asking "Where is ____?" The

procedure was similar to the first study except that when the children asked "Where is ____?" they

were told "I gave it to someone" upon which they were required to ask "Who has it?" There was

not a difference in the rate of acquisition between the preferred and the non-preferred items, and

one child successfully maintained the skill 6-months after the termination of the study. However, I

believe that an S^D may have been present since on every trial the children were told "Go get"

and/or "I gave it to someone". These statements may have functioned as S^Ds that evoked the

responses described above. More specifically, the response taught may have been an intraverbal

rather than a mand (Betz et al., 2010).

   In a systematic replication of the Sundberg et al. (2002) study, Endicott and Higbee (2007)

found similar results to those of Sundberg et al. (2002). Preschool children learned to mand

"Where (item)?" and "Who has it?", and generalization to a new environment and person (using the same procedure as the teaching procedure) was assessed for the mand "Where?" and was successful. Neither Sundberg et al. (2002) nor the Endicott and Higbee assessed whether this procedure produced generalization to the natural environment. Betz et al. (2010) examined this question. They found that the three children who participated in their study were able to use the mand "Where (item)?" with novel toys in both the teaching environment and a novel environment, when the same verbal stimulus (i.e., "Let's play. Get (item)") was delivered. However when this verbal stimulus was eliminated and items were missing within a child's every day routine (e.g., shoes missing when it was time to go for a walk), none of the children correctly manded "Where (item)?" Teaching then occurred in the natural environment. After mastery of one natural routine one child successfully used the mand "Where?" across other untrained routines. The other two children required at least three or more routines to be taught before generalization emerged. Researchers indicated that it is possible that a CMEO was not contrived during the initial training procedure and this may have resulted in failure for the mand to generalize. It is also possible that generalization to the natural environment may have failed, because the CMEOs were contrived differently. In training it was contrived by hiding a preferred item, in the natural environment it was contrived by hiding an item necessary to complete a chain of behaviours (i.e., an interrupted chain procedure).

Lechago, Carr, Grow, Love, and Almason (2010) taught three children with autism to mand either "Where spoon?" or "Who has (the) spoon?" The only verbal S^D provided was the one for the child to begin the activity (e.g. "Make the volcano"). They assessed whether the learned mands would generalize to novel CMEOs. For example they taught one child to mand "Where spoon?" when completing a volcano chain. Upon mastery they assessed for generalization to novel chains with a spoon missing (e.g., making chocolate milk). Results indicated that for all children

who learned the mands "Where spoon?" or "Who has spoon?", generalization to novel CMEOs occurred. Lechago et al. also assessed whether generalization across response topographies would occur. In other words they assessed whether the children who learned to say "Who has spoon?" would now be able to ask "Who has truck?", when the truck to a remote control truck activity was missing. For the child who learned to say "Where spoon?" they assessed whether he could now say "Where four?" (a puzzle piece), when a puzzle with a missing piece was presented. For the children who learned the mand "Who?", generalization to response topographies occurred. For the child who learned the mand "Where?" teaching was required to learn a new response topography. A stronger mands for information repertoire may have helped the generalization to emerge for the children learning to mand "Who?" (Lechago et al.).

Similarities and Differences of the Present Research to Previous Research

My research is similar in several ways to previous research on teaching mands to children with autism. First, given the success of using natural consequences (e.g., Lechago et al. 2010) rather than programmed reinforcers (Twardosz & Baer, 1973) I used the former.

Second, a large emphasis when teaching mands for information has been to teach children to ask "What?" when presented with unknown items (e.g., Taylor & Harris; Twardosz & Baer; Warren et al., 1981). Only one study (Roy-Wsiaki et al., in press, which I co-authored) taught a child to mand "What?" in different CMEOs to gather different information. My research expanded on the previous literature by using a modified version of the Roy-Wsiaki et al. procedure and by teaching "Where?" and "Which?"

Third, children with autism participated in many of the studies that taught mands for information (e.g., Betz et al., 2010; Charlop & Milstein, 1989; Endicott & Higbee, 2007; Knapczyk, 1989; Ingvarsson & Hollobaugh, 2010; Lechago et al., 2010; Sundberg et al., 2002;

Williams et al., 2000). The present research also taught mands for information to children with autism.

Fourth, in some of the previous studies (e.g., Endicott & Higbee, 2007; Sundberg et al., 2002; Williams et al., 2000) mands were taught in a forward-chain format. In the present research I taught in a forward chain format for the mands "Where?" and "Which?" That is, when teaching the mands "Where?" and "Which?" the children were taught to first mand "Where?", then upon mastery of the mand "Where?", the children were required to emit two mands ("Where?" and "Which?") before gaining access to the item.

Fifth, contriving motivating operations has been done in various ways. First, some studies (e.g., Carroll & Hesse, 1987; Hall & Sundberg, 1987; Lechago et al., 2010; Sidener et al., 2010; Roy-Wsiaki et al., in press; Tada & Kato, 2005) have used an interrupted chain procedure (i.e., a procedure whereby an item needed to complete a chain of responses is missing) which has been shown to be successful. In the present research, I utilized this procedure by presenting activities with an item missing (e.g., hiding the glue needed to complete a craft) and presenting an activity that needs more of something present (e.g., needing more vinegar to make the volcano erupt). Hiding preferred items (e.g., Betz et al., 2010, Endicott & Higbee, 2007; Sundberg et al., 2002, Roy-Wsiaki et al.) and hiding unseen items (e.g., William et al., 2000) have also been effective strategies used to contrive motivating operations. In the present research I also contrived motivating operations in these same ways and assessed for generalization across each CMEO.

Sixth, teaching procedures have consisted of an echoic prompt (e.g., Betz et al., 2010; Ingvarsson & Hollobaugh, 2010; Lechago et al., 2010; Sundberg et al., 2002; Williams et al., 2000) and prompt delay and prompt fading (e.g., Betz et al.; Braam & Sundberg, 1991; Halle et al., 1979; Hartman & Klatt, 2005; Ingvarsson & Hollobaugh; Sundberg, San Juan, Dawdy, &

Argüelles, 1990; Sundberg et al., 2002; Taylor & Harris, 1995). I also used these teaching procedures in this research.

My research expanded in several ways on previous research on teaching mands to children with autism. First, with the exception of my co-authored study (Roy-Wsiaki et al., in press) none of the previous published studies have taught children to mand for information while engaging in an activity with others (e.g., baking cookies or doing a craft). In the present research participants chose the activities that they wanted to play and CMEOs were contrived for the participants to mand. Prompting occurred to teach mands and when the children emitted the correct mand they were given the natural consequences associated with the mand (such as an answer to their question and an opportunity to continue or finish the activity).

Second, generalization to different CMEOs and scripts was not objectively measured in any of the above-mentioned studies. In the Lechago et al. (2010) study they examined whether the topographically same mand would generalize to different activities. However the way in which motivation was contrived during generalization assessments was the same as in training (i.e., an item to a preferred activity was missing). In the present research I examined whether the same topographically similar mand would generalize when various CMEOs were presented (e.g., a preferred toy hidden during play, an item missing to a preferred activity).

Third, Betz et al. (2010) identified that using vocal scripts (e.g., "Let's play. Go get") during teaching of the mand "Where?" did not produce generalization to the natural environment when those scripts were not provided. That limitation was overcome in the present research by using various scripts for the mand "What?" during teaching, as well as assessing generalization to a novel script (for the mand "What?"), and not using any vocal script for the mands "Where?" and "Which?" (similar to Lechago et al., 2010).

Fourth Betz et al. (2010) identified that teaching in the natural environment was more successful than their structured teaching procedure. I examined whether teaching while engaging in activities would increase generalization to the natural environment.

Fifth, my research enhanced the literature on teaching children with autism to mand for information for several reasons: a) although there is more literature on the topic of teaching "What?", only one study has examined teaching "What?" outside of the context of asking for the name of something they see; b) no study to date has examined the verbal operants "Where?" and "Which?" together; and c) no study to date has examined teaching the mand "Which?"

Finally, it is important to demonstrate that, once a mand for information is acquired to a CMEO and with items/activities used during teaching, it will generalize to a novel CMEOs and novel activities as well. In the Sundberg et al. (2002) study, they anecdotally reported that one child began to spontaneously mand "Where is_____?" In the Roy-Wsiaki et al. (in press) and Betz et al. (2010) studies this was objectively measured. However Betz et al. was unsuccessful in producing generalization to the natural environment and only upon teaching in the natural environment did generalization emerge. In the Endicott and Higbee (2007) study they objectively measured whether generalization to a novel environment and person occurred. However their generalization probe procedure was the same as their teaching procedure. Further, both Sundberg et al. (2002) and Endicott and Higbee did not objectively measure whether generalization across time occurred for any or all of the participants. In the present research I measured generalization of each target mand in the natural environment (e.g., at home with the parents) before and after training, and I assessed generalization across time with the administration of one, two, and four week follow-up assessments.

General Statement of the Problem

Across three experiments, I taught five children with autism to mand for information using, one, two, or three of the mands; "What is it?", "Where?", and "Which?". The teaching procedure consisted of, contrived CMEOs, prompt delay and prompt fading, providing the consequence specified by the mand, an error correction for errors, and a brief preference assessment. Upon the successful acquisition of the mands, tests for generalization were conducted. It was predicted that: (a) the children would learn to emit the above-mentioned target mands, (b) generalization to novel contrived CMEOs would occur and be maintained, and (c) there would be an increase in the frequency of the learned mands outside of the teaching sessions.

EXPERIMENT 1. TEACHING CHILDREN WITH AUTISM TO MAND USING "WHAT IS

IT?"

Statement of the Problem

In Experiment 1, I assessed whether a teaching procedure consisting of contrived motivating operations, progressive prompt delay and prompt fading, natural consequences for correct responses, an error correction, and a brief preference assessment would be effective in teaching three children with autism to mand "What is it?" It was predicted that: (a) the children would learn to emit the target mand, (b) generalization to novel contrived CMEOs and successful follow-up would occur, and (c) there would be an increase in the frequency of the learned mand outside of the teaching sessions.

Method

Participants and Setting

The participants were recruited from the St.Amant ABA Program for Children with Autism. The inclusion criteria consisted of children who: (a) could mand for basic items (Sundberg et al., 2002), (b) could tact (Sundberg et al., 2002) (c) were able to communicate using some type of communication system (e.g., sign language, pictures, talking device, speaking), and (d) had an expressive and receptive language age-equivalence of at least 24 months.

Children were excluded if they: (a) did not display the above-mentioned skills, (b) currently used the mand "What?" during the baseline assessments, or (c) displayed challenging behaviours (e.g., tantrums, aggression, destruction to property) across several sessions lasting more than 10 minutes that interfered with the teaching sessions. Only one child recruited for the study was excluded from the study because he was reported to use the mand "What?," and I also observed him use this mand during my initial visit.

Zach was a 4-year old boy diagnosed with Autism Spectrum Disorder (ASD). He had been participating in the St.Amant ABA program for approximately 2 years. According to his parents Zach could mand for information using the mand "Who?" in specific play situations. According to his ABA consultant, Zach could tact more than 100 pictures and objects, answer intraverbal questions about functions, features, and classes, and could answer 15 personal questions. His consultant reported that when speaking, he used an average of three to five words, and when manding he used an average of four to six words. According to the Preschool Language Scale 4th edition administered prior to the study, Zach had an Auditory Comprehension age-equivalence of 3 years 4 months (standard score of 75), an Expressive Language age-equivalence of 2 years 8 months (standard score of 63), and an overall communication age-equivalence of 2 years 10 months (standard score of 66).

Kevin was a 5-year 7-month old boy diagnosed with ASD. He had been participating in the St.Amant ABA program for approximately 18 months. According to his parents Kevin could mand for information using the mand "Where?" According to his ABA consultant, Kevin could tact between 75-100 pictures and objects, answer intraverbal questions about functions and features, and could answer 16 personal questions (some in French and some in English). His consultant reported that when speaking, he used an average of three to six words and when manding he used an average of three to five words. According to the Preschool Language Scale 4th edition administered prior to the study, Kevin had an Auditory Comprehension age-equivalence of 4 years 3 months (standard score of 72), an Expressive Language age-equivalence of 3 years 7 months (standard score of 65), and an overall communication age-equivalence of 3 years 11 months (standard score of 65).

Luke was an 8-year 5-month old boy diagnosed with Autism. He had been participating in the St.Amant ABA program for approximately 5 years. According to his parents Luke could mand

for information using the mand "Where?" According to his ABA consultant, Luke could tact more than 100 pictures and objects, answer intraverbal questions about functions, features, and classes, and could answer 6 personal questions. His consultant reported that when speaking and manding he used an average of three to four words. According to the Clinical Evaluation of Language Fundamentals, Fourth Edition, Luke received age-equivalent scores between 4 years and 6 years 11 months across subtests. Core and Index standard scores ranged from 42 to 65.

Teaching sessions took place in each participant's home. Various rooms of each house were utilized to accommodate the activities and promote generalization.

Apparatus

Tests and Questions

The Preschool Language Scale (4th ed; Zimmerman, Steiner, & Pond, 2002) was used to assess Zach and Kevin's expressive and receptive language age-equivalences and standard scores. The Clinical Evaluation of Language Fundamentals (4th ed; Wiig & Secord, 2004) was used to assess Luke's language. Parents completed a questionnaire with the researcher which contained questions about their child's abilities and preferences (see Appendix A). Consultants were given a questionnaire about their client's language abilities (see Appendix B). Social validity questionnaires prior to teaching and upon the termination of the study were given to the parents and consultants (see Appendix C).

Teaching Materials

CMEO's were contrived as done by Roy-Wsiaki et al. (in press). Three scripts were used by the experimenter that told the experimenter how to behave. In order for CMEOs to be contrived and scripts to be carried out, preferred activities as reported by the parents in the pre-assessment questionnaire were used to select teaching materials. Prior to beginning, a participant was given a choice of which of three activities he would like to play. Prior to trial 3 a participant was given a

choice of which of the two remaining activities he would like play. Before teaching, if a participant appeared uninterested (e.g., said he did not want to play, kept walking away) in an activity identified by the parents then a different activity was selected and tried. This only happened once with Luke; the generalization activity that was initially selected was decorating cupcakes, however when we tried this activity he only wanted to eat the icing. We then tried making pudding which seemed to be a more preferred activity. If a participant began to loose interest in certain activities due to the long nature of the study, variations of that activity were introduced. For example with Zach, rather than only playing the Play-Doh® Spaghetti Factory™ we also introduced Coco-Nutty Monkey™, and other Play-Doh® accessories. Participants responded well to this and motivation to use the mand "What?" was still present.

Zach's activities consisted of sand play (sand, pail, shovel, moulds etc), a tea set/pretend cooking (toy tea pot, cups, stove top, cakes, frying pan, etc.), and Play-Doh® (Spaghetti Factory™, Coco Nutty Monkey™; cookie cutters, rolling pin, and other Play Doh® accessories; *CMEO 1, hide-and-seek),* puzzles, wooden coloured blocks with pictures of block structures, and board games (Dr. Seuss™ The Cat in the Hat, I Can Do That Game and Living and Learning Soundtracks, Discover and Learn, Match a Balloon Game®; *CMEO 2, missing item*), bubbles (soap, wands, etc.), making a volcano (narrow vase/bottle, food colouring, baking soda, vinegar), and beading (string and beads; *CMEO 3, requiring more*), and a movie (Franklin and the Computer), chocolate, and a ball (*CMEO 4, surprise*).

Kevin's activities consisted of a Fisher-Price® Little People® Animal Sounds Farm™ and farm animals, fishing (toy fishing rod, fish, net, butterflies, shark), and Play-Doh® (Play-Doh® and accessories, knife, scissors, cookie cutters, etc., *CMEO 1, hide-and-seek*), MB™ electronic Guess Who™ Extra game, doing crafts (e.g., construction paper, makers, glue, popsicles sticks, feathers, etc.) fishing (fishing rod, fish, net, butterflies, shark; *CMEO 2, missing item*), bubbles

(soap, wands, Gazillion® bubble BBQ), face painting (face paint and paintbrush), and decorating a cupcake (cupcake, icing, sprinkles, *CMEO 3, requiring more*), a book, trail mix, and Pokémon® (*CMEO 4, surprise*).

Luke's activities consisted of sand play (sand, pail, shovel, moulds etc.), water play (soap, fish, cups, boat, Squirts™, etc.), and Play-Doh® Spaghetti Factory™ (*CMEO 1, hide-and-seek*), books on tape, bowling, and board games (Hasbro™ Hungry Hungry Hippos® and Scholastic Briarpatch® I Spy™ Preschool Game; *CMEO 2, missing item*), bubbles (soap, wands, Gazillion® Bubbles BBQ, etc.), making a volcano (narrow vase/bottle, food colouring, baking soda, vinegar), and making slime (water, plastic bags, corn starch, food colouring; *CMEO 3, requiring more*), and Robert Munch books, a sucker, and Skittles® (*CMEO 4, surprise*).

Generalization Materials

A novel preferred activity was selected for the generalization assessment. This activity was chosen from the list of activities provided by the parents, and was an activity that could be done in each contrived CMEO. For Zach and Kevin, this consisted of baking cookies or other goods, for Luke it consisted of making pudding. Materials used during natural environment observation consisted of household items, toys, and activities etc. that were part of the participant's daily routines.

A video camera was present for most sessions during each phase of the study.

Research Design

In order to evaluate the teaching package for the mand "What is it?" within each participant, a modified multiple-baseline design[3] across four CMEOs was used. This was replicated with each participant. Initially a baseline across the four CMEOs and generalization

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[3] This design has also been referred to as a multiple-probe design (Horner & Baer, 1978). The name modified multiple baseline as been used in various published research articles (e.g., Salem et al., 2009; Thiessen et al., 2009).

probes were done for the mand "What is it?" Once the baseline was completed, the teaching of the

mand "What is it?" began in *CMEO 1, hide-and-seek* (described later). Once the participant met

the mastery criterion (described later), a probe for generalization of the mand "What is it?" across

the untaught CMEOs and generalization probes (novel activity/script, and natural environment)

were conducted. If the participant did not emit the mand "What is it?" 100% of the time in the

untaught CMEOs, then teaching of the mand "What is it?" began in *CMEO 2, missing item*

(described later). Upon mastery of the mand "What is it?" in the CMEO 2, probes in CMEOs 3

and 4 and the other generalization probes (novel script/activity, and natural environment) were

administered. If generalization did not occur, teaching in *CMEO 3, requiring more* (described

later) began. Upon mastery of the mand "What is it?" in the CMEO 3, generalization probes across

CMEO *4, surprise* (described later) and other generalization probes (novel activity/script and

natural environment) were administered.

<p style="text-align:center;">*Procedure*</p>

Assessments Prior to the Study

Just prior to beginning teaching or the administration of the baselines, a pre-teaching

assessment was conducted to ensure that the participants could respond to the echoic prompt.

Twenty echoic trials of the words "What", "Where", "Which one", and "Who" (five trials per

word) were presented to the participant. If the participant responded correctly, praise was given

(for some children additional reinforcement such as access to toys or tokens was given). Teaching

only began if the participant was able to echo these words 90% - 100% of the time. For all

participants in Experiment 1, this was only administered once.

Baseline Phases Prior to Teaching in any CMEO

Baselines were administered prior to teaching "What is it?" in a CMEO.

Baseline in the natural environment. A baseline of the frequency a participant used the mand "What?" in the natural environment was taken. Parents were asked to interact with their child as they typically would. For Zach this commonly consisted of practicing the piano, playing games, eating, and playing with toys. For Luke this consisted of doing homework and playing games. For Kevin this consisted of playing with toys and games. While engaging in these activities the parents were asked to contrive opportunities for their child to mand "What?," in two different ways. The first was by showing a closed container to their child, peeking in, and saying "oh", and then closing the container. The second consisted of saying various vocal scripts (e.g., "I found something"). Five vocal scripts that were not used in teaching (see Table 2) were given to the parents and the parents were asked to use at least one at least once. One non-vocal script was given to the parents (peeking in a container), and the parents were asked to use this at least once. Parents were permitted to use as many of the scripts as they wanted and also use novel ones not listed. Parents interacted with their child for one hour or until 10 opportunities to mand had been given (whichever came first). Rules given to the parents were; (a) interact with your child until the experimenter says stop (we did not want to tell the parents the number of opportunities to contrive as we wanted the interaction to stay natural and the focus to be on the interaction and contriving good opportunities rather than the amount); (b) if your child does not respond within 15-30 s, tell him the name of the item; (c) don't use any of the activities that will be used in teaching; (d) avoid solitary activities; (e) if your child mands "What?" tell him what is hidden; and (f) other family members could be present (Kevin became very upset when his siblings were involved in the activities therefore only his mother was present). When necessary the experimenter would give examples of ways of how the parents could contrive opportunities. During the observation, the experimenter did not participate in any of the activities, and interactions were limited to answering

Table 2.

Natural Environment Observation Scripts Given to the Parents for the Mand "What is it?"

Type of Script	Script
Vocal Script	1. "I know what we can use/get/add/play" 2. "I found something/it" 3. "I'm looking for something/it" 4. "Where is it?" 5. "I see something/it"
Non Vocal Script	6. Open container, look inside, say "ohhh" (don't show your child's what's inside)

Table 3.

Samples of the Mand "What?" that were Considered Correct and Incorrect

Mand	Sample of correct responses	Sample of incorrect responses
What	What	Wha,
	What's missing	Where, which one, who
	What is it	(names the item)

the parent's questions and asking parents to contrive an opportunity in a certain way, at times

when only one way had been contrived so far.

Spontaneous mands were scored in one of two categories; when a vocal script was given,

and when a vocal script was not given. Vocal scripts (see Table 2) were defined as sentences or

phases containing words given by the parents. Non-vocal scripts were defined as body gestures

and or sounds (e.g., "Ah", "oh") given by the parents. Spontaneous mands were considered correct

if they contained the word "What?" (e.g., "What?"; "What is it?", "What happened?", see Table

3). Missed Opportunities were defined as when a parent makes a statement using a pronoun (e.g.,

it, something) so that a request by the participant for more information by asking "What?" would

be appropriate and the participant failed to mand appropriately to get more information regarding

the pronoun given, or when the parent made a sound or body gesture regarding an item or situation

with a missing, needed, or wanted component (e.g., saying "oh" when they could not find a

missing puzzle piece) and the participant failed to mand. In addition, each time the parent used a

different script this was considered a new opportunity. If the parent used one script, the participant

asked "What?" and the same script was used 2 – 3 s later, then this was also considered a new

opportunity. If the same script was used within 10 s (e.g., the parent said "I found something…….I

found something") and the participant did not appropriately mand between the two scripts, then it

was considered one opportunity (not two). The following situations were not scored as successful

or missed opportunities; (a) a participant found the hidden item; (b) a participant gave an

appropriate answer (e.g., the parent said "I found it" and the participant said "You found my

dinosaur"); (c) if a participant used the target mand in an inappropriate way; (d) if a sibling used

the mand and the participant immediately repeated what the sibling said. Natural environment

observations produced two scores, the percentage of the spoken mand "What?" when vocal scripts

were given, and the percentage of the spoken mand "What?" when non-vocal scripts were given.

A score was calculated by dividing the number of spontaneous mands by the number of spontaneous mands plus missed opportunities, and multiplying by 100%.

     Baseline of the CMEOs. Prior to the commencement of teaching within a CMEO (described in detail later), three baseline trials for each CMEO, were administered, one for each of the three activities that were used in teaching. If a participant correctly manded across each of the three baseline trials in each CMEO, then this mand was considered acquired and was not taught. A baseline trial consisted of approaching the participant or beginning the activity (as described later in the description of the CMEOs). Then, the experimenter said a script, and the participant had 4 s to respond by using the mand "What?" If the participant correctly manded, then the answer to his question was given and the participant was shown the item and permitted to play with the item. If the participant made an error or did not respond, then the trial was terminated, and the item was not named or shown.

     Baseline of the novel activity and scripts not used in teaching. A baseline of the generalization task was taken prior to teaching. Novel scripts and an activity were presented to the participant. A total of four trials were contrived, and each trial was contrived in a similar fashion to each of the four CMEOs. If a participant emitted the correct mand, then the answer to his question was given and the participant was shown the item. If a participant made an error or did not respond within 4 s, then the item was not named or shown, the experimenter waited 5 s then she casually took the item needed to continue the remainder of the trials. The item was not mentioned and attention to the item was not given (e.g., "oh here is the missing spoon" was not said).

     The following is an example of how the baking cookies activity was administered. The experimenter approached the participant with a present in hand. She shook the present in front of the participant. If he said one of the correct versions of "What?" (see Table 3) then the

experimenter opened the present and said "It's a cookie, let's bake some cookies," and they went into the kitchen. If the participant failed to mand, then the present was put aside and the participant and experimenter went into the kitchen. Once in the kitchen, the experimenter and the participant began to make cookies. The participant added the ingredients as the experimenter read out the recipe. At one point, there was not enough of an ingredient. For example the recipe called for 1 cup of chocolate chips, but there were only 3 chocolate chips on the counter. At this point, the experimenter gasped and put her hand on her mouth. If the participant manded "What is it?" the experimenter responded by saying "We don't have enough chocolate chips" and added more chocolate chips. If the participant failed to mand "What?" or "What is it?" the participant and experimenter continued adding the ingredients and at a later point, the experimenter casually added the chocolate chips. Once all the ingredients were added and the dough was mixed, it was time to place the cookies on the cookie sheet, but the spoon was missing. At this point the experimenter sighed; if the participant asked, "What?" or "What is it?" the experimenter said "We don't have the spoon," and the spoon was given to the child. If the participant failed to mand correctly, then the spoon was casually brought out in order to finish the activity. Cookies were placed in the oven; the participant was shown the cookies baking, then the participant and experimenter went into another room of the house. Once the cookies were done baking, they were hidden out of sight of the participant. The experimenter and participant returned to the kitchen to see the baked cookies, but instead the participant saw an empty cookie sheet. At this point the experimenter began whistling and looking around suspiciously. If the participant manded "What?" or "What is it?" the experimenter said "I hid the cookies," the cookies were shown to the participant, and he then was given one. If the participant failed to mand correctly then the activity was terminated.

Teaching Phase

The teaching procedure consisted of five components: (a) contrived CMEOs and scripts, (b) prompt delay and prompt fading, (c) natural consequences for correct responding, (d) error correction, and (e) a brief preference assessment.

Contrived CMEOs and scripts. The study contrived motivating operations differently across four CMEOs and three scripts. Two scripts (Scripts A and B) were used for teaching and the third script (C) was used for generalization. The four teaching CMEOs were: (a) *hide-and-seek*, (b) *missing item*, (c) *requiring more*, and (d) *surprise* (see Appendix D for details). Four teaching trials were administered in one teaching session for one CMEO (two trials for each Script, A and B) and activity. The mastery criterion was met when the participant made seven correct independent target mands across two consecutive teaching sessions in a CMEO. CMEO 4, *surprise*, was not exposed to the teaching package therefore its description below outlines the procedure for the baseline and generalization assessments. In other words the training procedure was not implemented for CMEO4, *surprise*.

CMEO 1. Hide-and-seek. In *CMEO 1,* the experimenter and the participant began by doing an activity. The toy from the activity that the participant played with the most was the toy that was hidden. Once the item was hidden the experimenter began either Script A or B. Once the script began, then the prompting procedure (described later) commenced. The following is an example of teaching the mand "What is it?" with one of the activities and Script A. Suppose that while playing with Play Doh® and Play Doh® accessories (e.g., knife, roller, cookie cutters) the participant continuously used a certain cookie cutter (e.g., the dog cookie cutter); therefore this item was hidden when the participant was not looking. When the participant noticed that the cookie cutter was missing (e.g., began searching for approx 2 to 3 s, named the item) the experimenter laughed to herself, and the participant was prompted to ask "What is it?" once the

participant responded to this prompt, the experimenter would say, "the dog cookie cutter", and the hidden item was shown to the participant and the activity resumed.

CMEO 2. Missing item. In *CMEO 2,* an item needed to complete an activity was hidden (out of sight of the participant) before the activity began. Once the item was hidden, the experimenter and the participant began by doing the activity and at different points in the activity and across trials (e.g., as they started, a minute or so afterwards, towards the end of the activity) the experimenter began either Script A or B. Once the script began, then the prompting procedure (described later) commenced. The following is an example of teaching the mand "What is it?" with one of the activities and Script A. While completing a puzzle the experimenter said "Oh, Oh" and began looking around, the participant was prompted to mand, "What is it?" Once the participant responded to this prompt the experimenter said, "We are missing the piece with the tail on it", and the missing piece was shown to the participant and the activity was completed.

CMEO 3. Requiring More. In *CMEO 3,* a small amount of one item needed to complete one of the activities was included with the other materials for that activity. Then the experimenter and the participant began by completing that activity. While attempting to complete the activity the experimenter began either Script A or B, once the script began, then the prompting procedure (described later) commenced. The following is an example of teaching the mand "What is it?" while making a volcano (and only a small amount of vinegar was provided), the volcano failed to erupt, the experimenter said, "Oh no!" with her hands and palms up, then the participant was prompted to mand, "What is it?" Upon successfully responding to this prompt the experimenter said "We need more vinegar" and the vinegar was shown and the activity was completed.

CMEO 4. Surprise. In *CMEO 4*, the experimenter approached the participant, began an activity and Script A or B. Script A consisted of the experimenter sitting in front of the participant and quickly taking something out of a bag and hiding it behind her back. Script B consisted of

opening a door a crack and peeking in (without the participant seeing what was inside) and saying "Ohh" and closing the door. The following is an example of the baseline and generalization procedure for the mand "What is it?" with one of the activities and Script A. The experimenter sat in front of the participant, took a book out of a bag quickly and hid it behind her back. If the participant manded "What is it?" the experimenter said "It's a book" and showed the participant the book and he was permitted to look at it. If the participant failed to mand, the item was not shown to the participant and the trial was terminated and scored as an error.

Progressive prompt delay and prompt fading. The prompt delay increased the latency between when the experimenter used the script and when the prompt was delivered. During prompt fading the experimenter faded out the intensity of a prompt across trials.

When teaching "What is it?" the prompt delay consisted of delivering prompts across four successive steps. On the first step the prompt was delivered after 0 s, on the second step the prompt was delivered after 2 s, on the third step the prompt was delivered after 4 s, and on the fourth step, a prompt was not delivered. The criteria to advance from one prompt delay step to the next was two consecutive correct responses to prompts and or no more than one full prompt across two consecutive responses. The regression criterion to return to a previous prompt delay step was 2 full prompts and/or errors (see below for a definition of errors) across two consecutive trials. Prompt fading consisted of fading the intrusiveness of the prompt across trials within the prompt delay. A full prompt consisted of telling the participant the entire response (i.e., "say What is it?"), and a partial prompt consisted of telling the participant part of the answer (e.g., "What?", "Wha", "Wh"). When teaching began, a full prompt (e.g., "say What is it") was given initially and this prompt was faded to a partial prompt (e.g., "Say wha") across the prompt delay steps. As the participant successfully responded to prompts the type of prompt was faded more and more (e.g., "Say wh"). The criterion for fading from a full prompt to a partial prompt was if the participant

correctly responded to a full prompt on two consecutive trials. The prompt returned from a partial

to a full prompt if the participant did not respond to the partial prompt on any given trial.

Natural consequences for correct responses. If a participant emitted the correct mand (see

Table 2 for a sample of the mands that would be considered correct) at the correct time, the answer

to his question was given and the item hidden or needed for the activity was shown. The

participant was allowed to take the item and continue the activity if he chose to do so.

Programmed reinforcers such as tokens and praise were not provided following the occurrences of

the mands.

Error correction. If a participant made any response other than the correct mand or did not

respond after 4 s on Step 4 of the prompt delay, then an error correction was delivered. The error

correction consisted of re-presenting the trial and prompting the response using the type of prompt

that would ensure success.

Preference assessment. Prior to the beginning of the study parents completed a

questionnaire with the experimenter indicating their child's preferences for toys, food, and

activities (see Appendix A). From this list, three activities for the teaching sessions were chosen.

At the beginning of trial 1, the participant was given a choice of which of the three activities he

would like to do. At the beginning of trial 3, the participant was given a choice of which activity

from the remaining two, he would like to do. If the participant appeared to lose interest in the

activity (e.g., no longer engaging in the activity, walked away), the choice was re-presented. If the

participant asked to change activities, his request was granted.

The scripts were randomly presented across four trials within a session. Script A was used

twice in a session and Script B was used twice in a session. A total of four different data sheets

were used, each with a different script order. A different data sheet was used for each session.

Post-Assessments

Post-assessments occurred once a participant met the mastery criterion to a CMEO.

Generalization to the natural environment. Upon mastery of a mand to a CMEO, the participant was observed during approximately 1-hour or 10 opportunities (whichever came first) in the natural environment. This observation was conducted in the same fashion as in the baseline phase. The definitions of a successful mand, missed opportunity, vocal script, and non-vocal script were the same as in baseline. The scoring method was also the same as in baseline.

Generalization to a novel activity and scripts. After mastery of a mand to a CMEO, generalization to a novel activity and script (Script C) was assessed. While doing this activity four trials were conducted. Each trial was contrived similar to one of the four CMEOs. This was administered in the same way as in baseline.

Follow-up. One, two, and four week follow-ups were administered for CMEOs that had undergone the teaching procedure. For CMEOs in which the participants used the mand "What is it?" during baseline, only a one-week follow-up was administered. The three activities used in teaching were presented to the participant and he was given the choice of which activity he would like to complete. The follow-up procedure was the same as the baseline procedure for CMEOs except only one trial was administered. See Table 4 for a summary of the assessments done in each phase.

Reliability and Validity

Inter-observer reliability (IOR). The observer recorded the participant's response on each trial. An agreement was scored if the observer and the experimenter recorded the same response emitted by the participant (e.g., both recorded that the response was an error). A disagreement was scored if the observer and experimenter recorded that the participant emitted different responses (e.g., the observer recorded that the response was an error and the experimenter recorded that the

Table 4.

Summary of the Assessments Done During Each Phase of Experiment 1.

Phase	What needs to be done	Number of trials
Prior to baselines or teaching	Echoic pre-teaching	20 (5 for each of the words; "What?"; "Where?", "Which one", and "Who")
Prior to Teaching a Mand	Natural Environment Observation	10 opportunities or 1 hour
	Baseline in CMEO 1	3 (one trial for each activity)
	Baseline in CMEO 2	3 (one trials for each activity)
	Baseline in CMEO 3	3 (one trials for each activity)
	Baseline in CMEO 4	3 (one trials for each activity)
	Generalization to a novel script and activity	4 (one trial for each CMEO)
When a mand is mastered in a CMEO following exposure to the teaching package	Natural Environment Observation	10 opportunities or 1 hour
	Generalization to a novel script and activity	4 (one trial for each CMEO)
	Generalization to untrained CMEOs	3 trials for each CMEO
	Follow-up	1 trial for each time period (1-week, 2-week, 4-week)
When a mand is used 100% of the time in baseline	Follow-up	1 trial (1-week follow-up)

response was prompted). An IOR score for a session was calculated by dividing the number of agreements by the number of agreements plus disagreements for that session and multiplying by 100% (Martin & Pear, 2007). For the natural environment observations, the IOR score was calculated by taking the sum of the number of agreements for spontaneous mands and the number of agreements for the missed opportunities and dividing by the sum of the number of agreements plus disagreements for spontaneous mands and the number of agreements plus disagreements for missed opportunities and multiplying by 100%.

For Zach, IORs were taken for 100% of the pre-teaching sessions, 69% of the CMEO assessments, 73% of the teaching sessions, 50% of the generalization assessments and follow-up, and 80% of the natural environment observations. Average IORs were 100% for the pre-assessment, 100% for CMEO assessments, 93% for teaching sessions (range 75-100%), 100% (range 72-100%) for generalization assessments and 86% (range of 83-100%) for the natural environment observation.

For Kevin, IORs were taken for 100% of the pre-teaching sessions, 88% of the CMEO assessments, 82% of the teaching sessions, 75% of the generalization assessments and follow-up, and 100% of the natural environment observations. Average IORs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, and generalization assessments and follow-up. Average IOR for the natural environment observations was 89% (range of 75-100%).

For Luke, IORs were taken for 100% of the pre-teaching sessions, 83% of the CMEO assessments, 70% of the teaching sessions, 92% of the generalization assessments, and 75% of the natural environment observations. Average IORs were 100% for the pre-teaching sessions, 100% for the CMEO assessments, 93% (range 75-100%) for the teaching sessions, 100% for generalization assessments and follow-up, and 94% (range of 90-100%) of the natural environment observations.

Procedural reliability (PR). A procedural data sheet outlining the steps that the experimenter should follow was used (see Appendix E to see a sample of the data sheets that were used). The observer and experimenter recorded on a data sheet whether each of the procedural steps was followed by the experimenter. An agreement was scored if both the observer and experimenter recorded that the experimenter followed the step or both recorded that the experimenter did not follow the step. A disagreement was scored if one recorded that the experimenter did or did not follow the step and the other recorded the opposite. A PR score for a session was calculated by dividing the number of agreements by the number of agreements plus disagreements for that session and multiplying by 100% (Martin & Pear, 2007).

For Zach, PRs were taken for 100% of the pre-teaching sessions, 69% of the CMEO assessments, 67% of the teaching, 54% of the generalization assessments and follow-up, and 75% of the natural environment observations. Average PRs were 100% for the pre-assessment, 100% for CMEO assessments, 98% (range of 86-100%) for teaching, 97% (range of 80-100%) for generalization and follow-up, and 100% for the natural environment observations.

For Kevin, PRs were taken for 100% of the pre-teaching sessions, 88% of the CMEO assessments, 82% of the teaching sessions, 75% of the generalization assessments and follow-up, and 100% of the natural environment observations. Average PRs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions (range 96-100%), generalization assessments and follow-up, and natural environment observations.

For Luke, PRs were taken for 100% of the pre-teaching sessions, 91% of the CMEO assessments, 60% of the teaching sessions, 93% of the generalization assessments and follow-up, and 75% of the natural environment observations. Average PRs were 100% for the pre-teaching sessions, 100% for the CMEO assessments, 99% (range 96-100%) for the teaching sessions, 100% for generalization and follow-up, and 100% for the natural environment observations.

Procedural integrity (PI). The PI score was determined by the data collected by the observer for computing the PR score. A PI score for a session was the number of steps the observer recorded that the experimenter followed correctly divided by the total number of steps and multiplied by 100%.

For Zach, PIs were taken for 100% of the pre-teaching sessions, 69% of the CMEO assessment, 79% of the teaching sessions, 54% of the generalization assessments and follow-up, and 60% of the natural environment observations. Average PIs were 100% for the pre-assessment, 100% for the CMEO assessments, 98% (range 92-100%) for teaching sessions, 100% for generalization and follow-up, and 100% for the natural environment observations.

For Kevin, PIs were taken for 100% of the pre-teaching sessions, 88% of the CMEO assessments, 82% of the teaching sessions, 75% of the generalization assessments and follow-up, and 100% of the natural environment observations. Average PIs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations.

For Luke, PIs were taken for 100% of the pre-teaching sessions, 83% of the CMEO assessments, 70% of the teaching sessions, 93% of the generalization assessments and follow-up, and 75% of the natural environment observations. Average PIs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations.

Social validity. Prior to commencing the study the parents and the ABA consultants of the participants were asked to complete a social validity questionnaire. On a scale of one (strongly disagree) to five (strongly agree) they were asked to rate how well they agreed with the following statements: (a) I think the goal of teaching my child/client to request using "WH" questions is an important goal for my child/client and (b) I think that the ability to request using "WH" questions

is an important language and communication skill. Upon completion of the study, social validity was measured to determine: (a) whether teaching the mand "What?" was important for their child/client, (b) if the parents/consultants' were satisfied with the procedure and, (c) if the parent/consultant's were satisfied with the results (see Appendix B). Parents and ABA consultants were asked to answer six questions using the same 5- point scale.

Results and Data Analysis

Within the modified-multiple-baseline-across-CMEOs design for a participant, judgements about whether the teaching procedure had an effect on the mand acquisition were made based on the visual-inspection guidelines described by Martin and Pear (2007). During baseline assessment Zach did not use the mand "What is it?" across any of the CMEOs, during the generalization task, or in the natural environment. After 8 sessions and 32 trials, Zach learned to mand in CMEO 1 (see Figure 1). At that time a natural environment observation was conducted. Zach manded correctly across 100% of the opportunities with non-vocal scripts, but failed to mand across opportunities with vocal scripts (see Figure 2). The generalization task (novel script and activity) was also presented and Zach manded "What is it?" consistently across each trial (4/4). Baselines of the untrained CMEOs were also assessed at that time. Zach manded 33% (1/3) in CMEO 2, and a second baseline session was administered and he received a score of 0%. In CMEO 3 he did not mand "What is it?" In CMEO 4, Zach's baseline score improved to 66% (2/3). Teaching began in CMEO 2, and after 22 sessions and 88 trials Zach met the mastery criterion. During the 7th teaching session in CMEO 2 (session 21 on the horizontal axis), Zach began asking "Who is it?" rather than "What is it?" Prompting occurred on the the first step of the prompt delay to try to avoid any errors. I found out that during the day (outside of research sessions), Zach had manded "What is it?" when it was more appropriate to ask "Who is it?" (e.g., when pointing to pictures of

Figure 1. Zach's results for teaching the mand "What is it?" Numbers under the data points represent the follow-up time period in weeks.

Figure 2. Zach's natural environment observation results for the mand "What is it?" before teaching and after the mand was mastered in each CMEO. Gray bars indicate when the parent gave a non-vocal script (Zach did not mand when scripts were presented).

people, when he heard the door bell ring) and he was being corrected by his family. Given that we were not seeing progress by the 16th teaching session of CMEO 2 (session 30 overall, see Figure 1) we consulted with his ABA team and family and they decided to stop correcting the mand "What is it?, as this was not a priority goal for Zach. Six sessions later, Zach met the mastery criterion. Following this mastery, a natural environment observation was conducted and Zach manded 100% of the time with opportunities when non-vocal scripts were presented, but he failed to mand during opportunities when vocal scripts were presented. The generalization task (novel activity and script) was presented and Zach manded 50% of the time. In CMEO 3, Zach's baseline score improved after meeting the mastery criterion in CMEO 2 and prior to training in CMEO 3, and he was now able to mand "What is it?" 66% (2/3) of the time. Because of the improvements in his baseline score, the baseline of CMEO 3 was administered two more times. Zach received a score of 66% and 100% each time respectively. Since he attained 100% in CMEO 3, a natural environment observation was administered once again, and Zach manded 100% of the time when non-vocal scripts were presented, but did not mand when vocal scripts were presented. When baselines of CMEO 4 were re-administered, Zach received a score of 33% after reaching criterion in CMEO 2 (session 39), and 100% after reaching criterion in CMEO 3 (session 35, see Figure 1). The generalization task was presented after reaching criterion in CMEO 3, and he received a score of 50% (2/4), and after reaching criterion in CMEO 4 Zach said "What is it?" 75% (3/4) of the time.

One, two, and four week follow-ups were administered for CMEO 1 and one, three, and four week follow-ups were administered for CMEO 2, and Zach manded "What is it?" each time. A one-week follow-up was administered for CMEO 3 and 4 (the two and four week follow-ups were not administered since teaching did not occur in these CMEOs), and Zach continued to mand "What is it?" After teaching, Zach was also heard to ask "What's that?" while pointing to pictures and objects and "What happened?" when something in his environment changed.

Prior to teaching, Kevin did not mand "What is it?" across any of the CMEOs, during the generalization task (novel activity and script), or during the natural environment observation. Teaching in CMEO 1 began and Kevin learned to use the mand "What is it?" after 6 sessions and 24 trials (see Figure 3). Following this mastery, the natural environment observation occurred; and Kevin manded appropriately 38% of the time when vocal scripts were presented, and 100% of the time when non-vocal scripts were presented (see Figure 4). Then the generalization activity was presented and Kevin failed to mand across any of the trials (0/4). Baselines of the CMEOs were also re-administered, and Kevin did not use the mand "What is it?" in CMEO 2 and 3, but manded 100% (3/3) of the time in CMEO 4.

Teaching then began in CMEO 2. Kevin met the mastery criterion after 6 sessions and 24 trials. Then, in the natural environment, Kevin manded "What is it?" 82% of the time when non-vocal scripts were presented and did not mand when vocal scripts were presented. The generalization task was then presented and Kevin correctly manded 75% (3/4) of the time. He was also able to mand in CMEO 3 (3/3), 100% of the time. The natural environment observation was conducted once again and Kevin used the mand 100% of the time when non-vocal scripts were presented, and 22% of the time when vocal scripts were presented. With the generalization task Kevin manded 100% (4/4) of the time. One, two, and four-week follow-ups were conducted for CMEO 1 and 2, and Kevin correctly manded each time. A one-week follow-up was conducted for CMEO 3 and 4 (two and four-week follow-ups were not conducted because these CMEOs were not taught), and Kevin manded during these follow-ups.
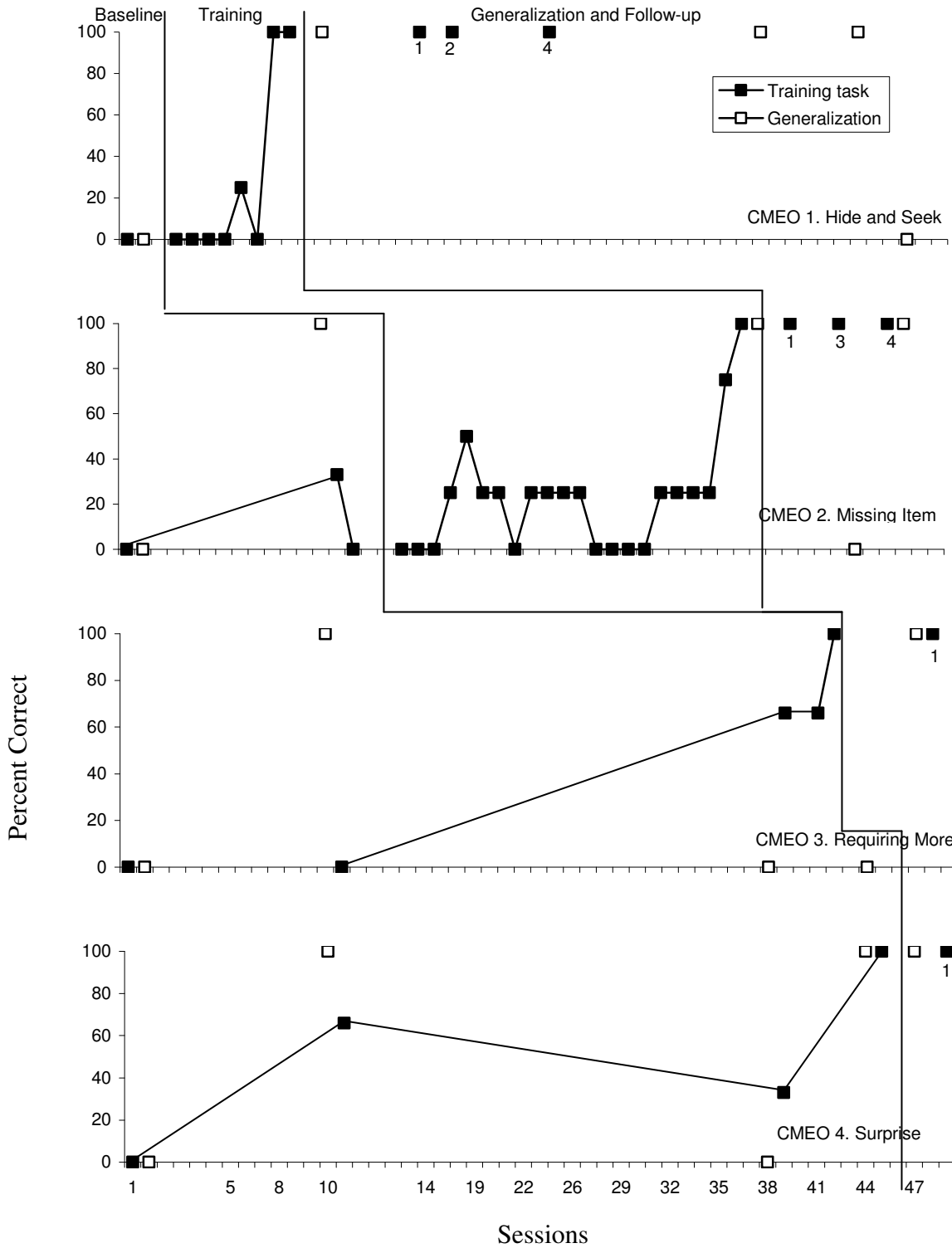
Figure 3. Kevin's results for teaching the mand "What is it?" Numbers under the data points represent the follow-up time period in weeks.
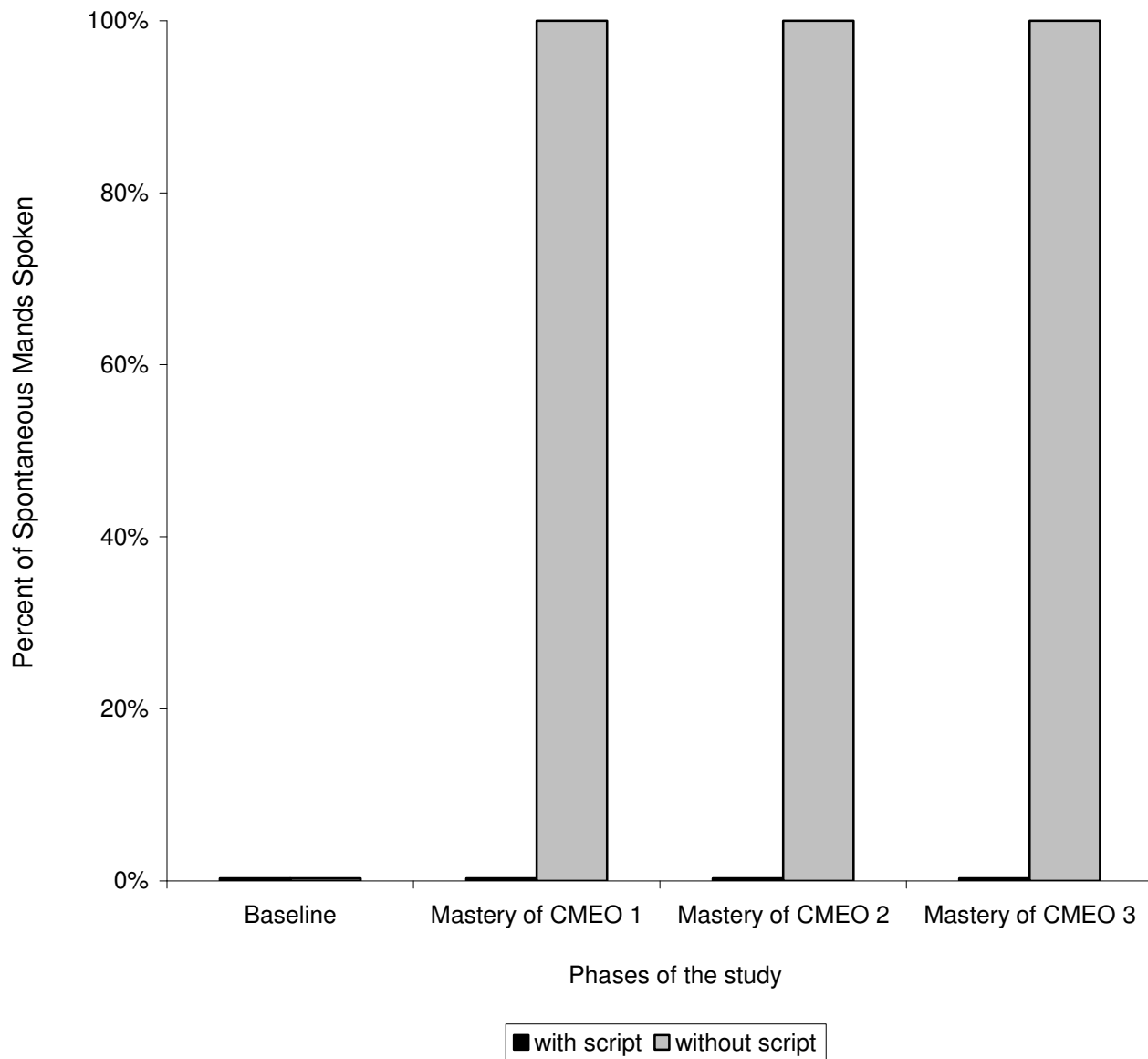
Figure 4. Kevin's natural environment observation results for the mand "What is it?" before teaching and after the mand was mastered in each CMEO. Black bars indicate when the parents gave a vocal script; gray bars indicate when the parent gave a non-vocal script.

Prior to teaching, Luke did not mand "What is it?" across any of the CMEOs, during the generalization task (novel activity and script), or during the natural environment observation. Teaching began in CMEO 1. Luke met the mastery criterion in 3 sessions and 12 trials (see Figure 5). A natural environment observation then was conducted and Luke manded "What is it?" 75% of the time when vocal scripts were presented and 100% of the time when non-vocal scripts were presented (see Figure 6). The generalization task (novel activity and script) was then presented and Luke correctly manded 75% of the time. Baselines of the CMEOs were re-administered and Luke manded 66% (2/3) of the time in CMEO 2. Therefore three more administrations of this CMEO were presented in order to achieve a stable baseline before teaching. On those three administrations Luke manded "What is it?" 0%, 33% (1/3), and 33% (1/3) of the time respectively. In CMEO 3, Luke's baseline score improved to 33% (1/3) and in CMEO 4, Luke's baseline score improved to 100% (3/3).

Teaching then began in CMEO 2, Luke met the mastery criterion after 4 sessions and 16 trials. Nearly three weeks had elapsed before we could observe in the natural environment. During this observation, Luke manded 20% of the time with vocal scripts and 50% of the time with non-vocal scripts (see Figure 6). It should be noted that on one of the first opportunities presented, Luke manded "What is it?", but it was not clear, therefore his mother repeated the script and he then echoed the script his mother said, and this response was reinforced with what should have been the answer to the question "What is it?" Following this, several opportunities were observed where Luke repeated the script rather than asking "What is it?" The generalization task (novel activity and script) was presented and Luke manded 100% (4/4) of the time (see Figure 5). In CMEO 3, Luke's baseline score remained the same at 33% (1/3), and in CMEO 4, Luke's baseline score was 100% (3/3).
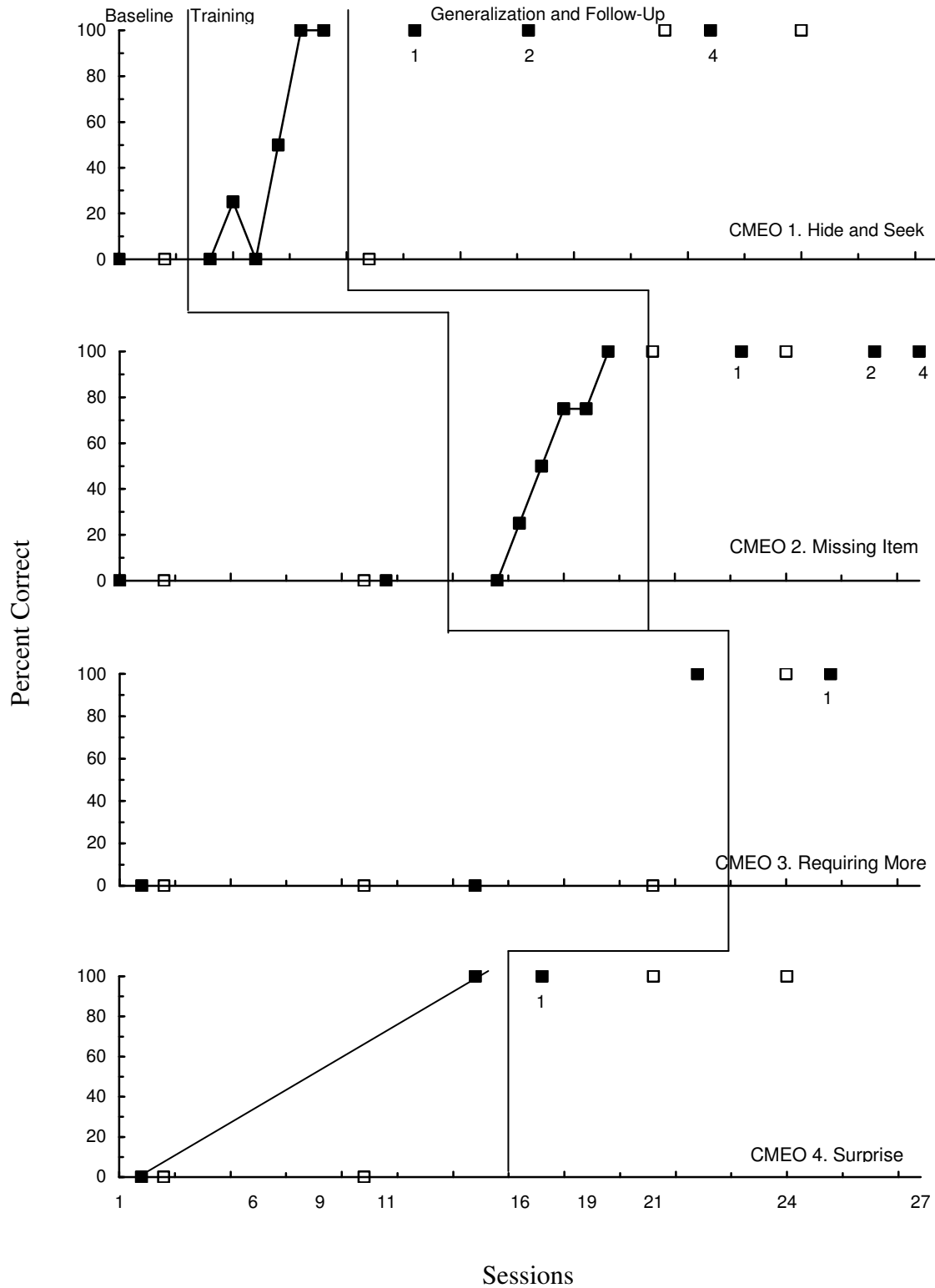
Figure 5. Luke's results for the mand "What is it?" Numbers under the data points represent the follow-up time period in weeks.
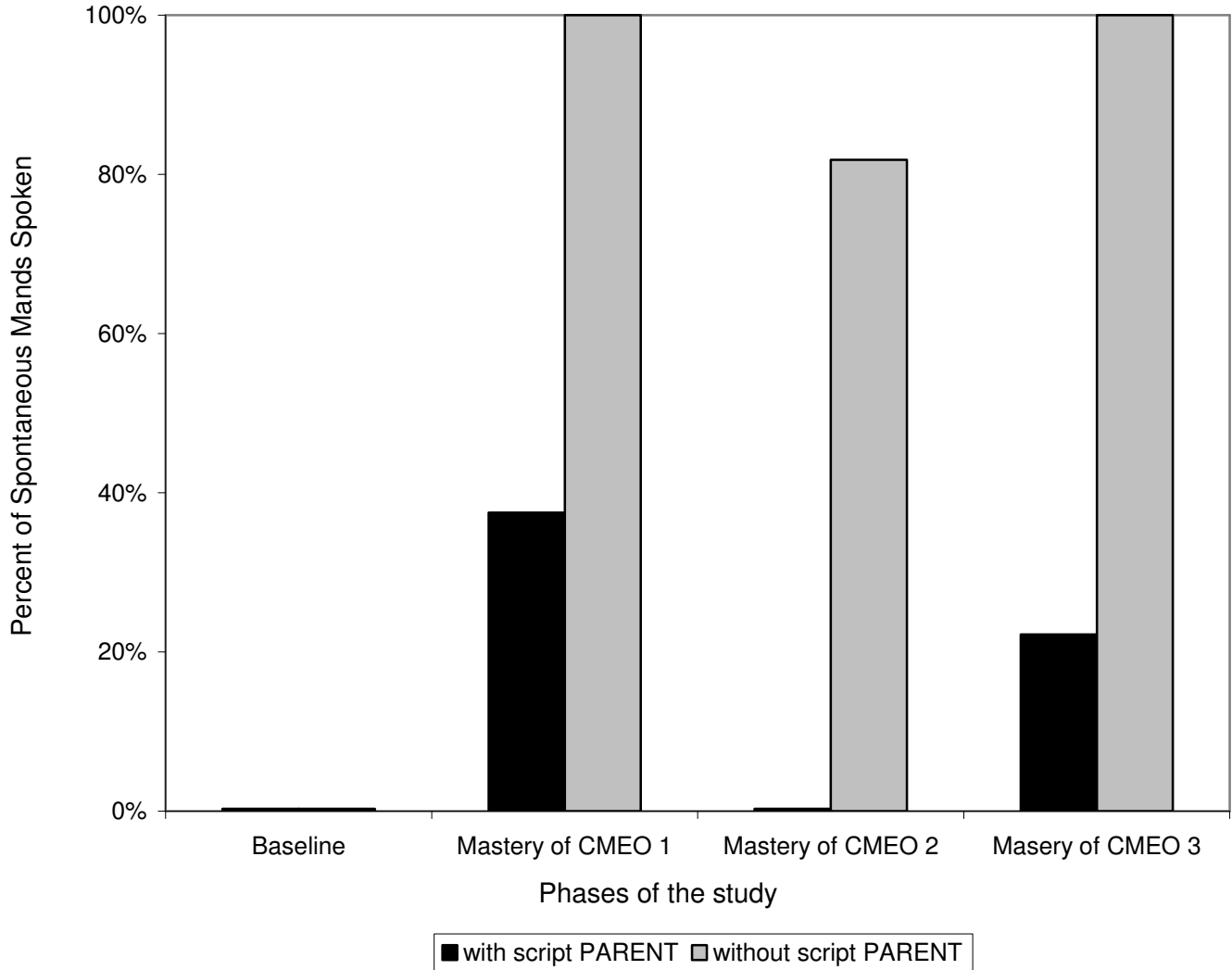
Figure 6. Luke's natural environment observation results for the mand "What is it?" before teaching and after the mand was mastered of each CMEO. Black bars indicate when the parents gave a vocal script, gray bars indicate when the parent gave a non-vocal script.

Teaching began in CMEO 3. Luke met the mastery criterion in 3 sessions and 12 trials. Then, during the natural environment observation, Luke manded appropriately 86% of the time with vocal scripts and 67% of the time with non-vocal scripts (see Figure 6). When the generalization task (novel activity and script) was presented Luke continued to mand "What is it?" 100% (4/4) of the time (see Figure 5).

One, two, and four week follow-ups were administered for CMEOs 1, 2, 3 and Luke manded "What is it?" appropriately each time. A one-week follow-up was administered for CMEO 4 (two and four-week follow-ups were not administered since teaching did not occur in this CMEO), and Luke continued to use the mand "What is it?" His ABA consultant reported that on one visit at his school, she was frantically looking through her binder for something and Luke manded "What is it?" and she responded by stating "I forgot something".

Prior to beginning the study, the parents and the ABA consultants were asked to rate on a 5-point scale two questions relating to the importance of teaching WH questions to their child/client and the importance of WH questions as a language or communication skill. For Zach and Luke both their parents and ABA consultants strongly agreed (score of 5) with both statements. For Kevin his mother strongly agreed with the statements and his ABA consultant agreed (score of 4) with the statements. Upon completion of the study, parents and consultants were asked how much they agreed with six statements relating to the goal of teaching "What is it?," and the satisfaction with the teaching procedure and results. On average Zach's mother's and consultant's scores averaged were a 4.5, Luke's mother's and consultant's scores averaged were 4.7, and Kevin's mother's and consultant's scores averaged were 5 and 4 respectively. Therefore, overall, parents and consultants were satisfied (see Table 5).

Table 5.

Results of the Social Validity Questionnaire on a Scale of 1 (strongly disagree) and 5 (strongly

agree) for the Mand "What is it?"

Questions	Zach		Luke		Kevin	
	Parent	Consultant	Parent	Consultant	Parent	Consultant
1. I thought the goal of teaching my child/client to request information using "What is it?" was an important goal for him.	5	5	5	5	5	4
2. I found the teaching procedure to be acceptable	4	5	5	4	5	4
3. I was satisfied with the efforts made to teach my child/client (name above) to request information by asking "What is it?".	4	5	5	5	5	5
4. I have observed my child/client requesting information by asking "What is it?" appropriately and more frequently.	4	3 (have seen a couple of times)	3	4	5	3
5. I would be willing to use this teaching procedure again to teach my child/client (name above) other skills (e.g., other WH questions).	5	4	5	5	5	4
6. I think that the ability to request information by asking "What is it?" is an important language and communication skill.	5	5	5	5	5	4

Discussion

The present study examined whether a teaching procedure consisting of contrived motivating operations, prompt fading and progressive prompt delay, natural consequences for correct responses, error correction, and a preference assessment would be effective in teaching three children with autism the mand "What is it?" None of the participants manded "What is it?" across any of the CMEOs prior to teaching. All the participants learned the mand. For all of the participants generalization to the natural environment, to a novel activity and script, and over time occurred.

Overall, the results with Experiment 1 were very positive. However differences in performance across participants were noted. First, Zach required many more teaching trials prior to reaching the mastery criterion in CMEO 1 and 2 compared to Luke and Kevin. A possible reason for this may have been that Zach was being corrected when using the mand "What is it?" to use the mand "Who is it?" in the natural environment, and this appeared to have resulted in an increase in the frequency of the mand "Who is it?" during teaching sessions. This correction may have put the mand "What is it?" on extinction in the natural environment, and thus when the correction stopped; it took several sessions before that mand re-emerged. Second, Kevin and Luke both correctly used the mand "What is it?" across some of the opportunities when a vocal script was given in the natural environment. Zach on the other hand did not. It is possible that a strong CMEO was not in place for Zach. Upon observation, when his mother would say a script, Zach often did not look up at her or even acknowledge that she had spoken. This is an indication that strong motivation was not present for Zach to mand. Third, Luke's natural environment generalization scores decreased once he had met the mastery criterion in CMEO 2. This may have been due to the fact that it was administered 18 days after mastery. The decrease may have also been due to the fact that on one of the first times that Luke appropriately used the mand "What is

it?" he said it quietly, his mother then repeated the script, at which time he repeated her script and she gave him the answer that would have been given had he asked "What is it?" Following this instance, Luke tended to repeat the scripts and this behaviour was reinforced by his mom. However after teaching in CMEO 3, Luke's scores increased. This may have been due to the fact that more reinforcement was provided for manding "What is it?" in between the two natural environment observations. Lastly, Zach and Kevin only required teaching in CMEOs 1 and 2 before generalization to CMEO 3 occurred. Luke on the other hand required teaching in 3 CMEOs before generalization to CMEO 4 occurred. Despite the fact that Luke required teaching in CMEO 3, overall he required fewer overall teaching trials. In other words Luke received a total of 40 teaching trials, Kevin received a total of 48 teaching trials and Zach received a total of 120 teaching trials. Luke also met the mastery criterion for CMEO 1 and 2 in fewer teaching trials compared to Kevin and Zach.

Similarities across participants were also noted. First, Zach and Kevin manded "What is it?" more frequently in the natural environment when non-vocal scripts were provided versus when vocal scripts were provided. This is likely due to the fact that the way in which the non-vocal script opportunities were contrived more closely resembled the way in which the trials during teaching were contrived. Also for Luke and Kevin once the mastery criterion was met in CMEO 1, generalization to CMEO 4, *surprise* occurred. For Zach higher scores were noted in CMEO 4, than the other CMEOs following mastery of CMEO 1. Therefore all the participants received higher scores in CMEO 4, *surprise* following mastery in CMEO 1, *hide-and-seek* compared to the other two CMEOs. A possible reason for this is that a positive history had developed between the experimenter and all the participants. On each session the experimenter brought preferred toys and played with the participants. However during the baselines of CMEO 4, the experimenter brought toys but did not let all the participants see them, and this may have

increased the strength of the motivation to see the item (i.e., to mand "What is it?"). For CMEOs 2 and 3, items were present, therefore it is possible that a stronger motivation to mand "What is it?" was present when the participants could not see the items brought by the experimenter.

One potential limitation to Experiment 1, is the potential violation of construct validity. It is true that most of the time the participants received the answer to their question as well as the tangible item upon emitting the mand "What is it?" Therefore one may argue that the participants were emitting the mand "What is it?" to access the tangible reinforcer. However, I would argue that construct validity was not violated because; (a) this procedure resembled other studies (e.g., Roy-Wsiaki et al., in press; Williams et al., 2000) whose results were successful, (b) in the natural environment, other forms of the mands "What?" emerged for some participants (e.g., Zach was heard to say "What's that?" and "What happened?"), and (c) tangible items were not provided following these new mands and these results were maintained several months following mastery. Future studies may want to consider comparing giving the tangible item versus just the information as the consequence and assessing for generalization.

Overall the findings are consistent with previous research. Only one study (Roy-Wsiaki et al., in press) examined teaching "What is it?" across four different CMEOs. No study to date has examined teaching "What is it?" in response to body gestures. Overall the findings are consistent with the Roy-Wsiaki et al. study. Prompting, reinforcement, and contrived CMEOs were used and found to be successful in increasing mands in this study as well as other studies (e.g., Betz et al.; Endicott and Higbee, 2007; Lechago et al., 2010; Sundberg et al., 2002). Limitations of this experiment are discussed later in the overall summary.

EXPERIMENT 2. TEACHING CHILDREN WITH AUTISM TO MAND USING "WHERE?"

Statement of the Problem

The purpose of Experiment 2 was to teach three children with autism to mand "Where?" The teaching procedure consisted of contrived CMEOs, constant prompt delay and prompt fading, natural consequences for correct responses, an error correction for errors, and a brief preference assessment. Upon the successful acquisition of the mand, tests for generalization were conducted. It was predicted that: (a) the children would learn to emit the above-mentioned target mand, (b) generalization to novel contrived CMEOs and successful follow-ups would occur, and (c) there would be an increase in the frequency of the learned mands outside of the teaching sessions.

Method

Participants and Setting

The participants were recruited from the St.Amant ABA program for children with autism. The inclusion criteria consisted of children who: (a) could mand for basic items (Sundberg et al., 2002), (b) could tact (Sundberg et al., 2002) (c) were able to communicate using some type of communication system (e.g., sign language, pictures, talking device, speaking), and (d) had an expressive and receptive language age-equivalence of at least 24 months.

Participants were excluded if they: (a) did not display the skills above, (b) currently used the mand "Where?" during the baseline assessments, and (c) displayed challenging behaviours (e.g., tantrums, aggression, destruction to property) across several sessions, lasting more than 10 minutes that interfered with the teaching sessions. Luke (Experiment 1) was excluded because he used the mand "Where?" appropriately during the natural environment observation. Kevin (Experiment 1) was excluded because he was reported to and observed to use the mand "Where?"

Zach who participated in Experiment 1 also participated in Experiment 2. He was 5- years old in Experiment 2. Zach was taught the mands "Where is it?" and "Where did it go?"

Chris was a 3 year 10 month old boy diagnosed with Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS). He had been participating in the St.Amant ABA program for approximately 1 year. According to his parents Chris could not mand for information. According to his ABA consultant, Chris could tact between 75-100 pictures and objects, answer intraverbal questions based on function, feature, and class, and could answer 4 personal questions. His consultant reported that when speaking, Chris typically used two to three words, and when manding he used five words. According to the Preschool Language Scale 4th edition administered prior to the study, Chris had an Auditory Comprehension age-equivalence of 3 years 5 months (standard score of 90), an Expressive Language age-equivalence of 2 years 4 months (standard score of 74), and an overall communication age-equivalence of 2 years 9 months (standard score of 80). While learning "Where?" Chris began to use the mand "What is it?" appropriately. Chris was taught the mand "Where is it?"

Connor was a 5-year old boy diagnosed with ASD. He had been participating in the St.Amant ABA program for approximately 1 year. According to his parents Connor could not mand for information. According to his ABA consultant, Connor could tact more than 100 pictures and objects. He was unable to answer intraverbal questions based on function, feature, and class. He could answer 29 personal questions. His consultant reported that when speaking and manding, Connor typically used three words. According to the Preschool Language Scale 4th edition administered prior to the study, Connor had an Auditory Comprehension age-equivalence of 2 years 5 months (standard score of 50), an Expressive Language age-equivalence of 2 years 3 months (standard score of 50), and an overall communication age-equivalence of 2 years 4 months (standard score of 50). While learning "Where?", Connor began to use the mand "What's that?" appropriately. Connor was taught the mand "Where is (item)?"

Teaching sessions took place in each participant's home. Various rooms of each house were utilized to accommodate the activities and promote generalization.

Apparatus

Tests and Questions

The Preschool Language Scale (4th ed; Zimmerman et al., 2002) was used to assess all the participants' receptive and expressive language age-equivalences. Parents completed a questionnaire with the experimenter about their child's abilities and preferences (see Appendix A). Consultants were given a questionnaire about their client's language abilities (see Appendix B). Social validity questionnaires prior to commencing and upon the termination of the study were given to the parents and consultants (see Appendix C).

Teaching Materials

CMEOs were contrived in four different ways, as done by Roy-Wsiaki et al. (in press). In order for a CMEO to be contrived, preferred activities and known locations as reported by the parents in the parent questionnaire were used. For each of the four CMEOs, three activities were chosen. Prior to each session a participant was given a choice of which of the activities he would like to complete. Before teaching I had planned that, if a participant appeared uninterested (e.g., said he did not want to play, walked away) in an activity identified by the parents, then a different activity was to be selected and tried. This did not happen for any of the participants. None of the participants appeared to lose interest (i.e., motivation was still present for them to mand) during the course of this study.

Zach's activities were the same as in Experiment 1 except that rather than building a block structure by copying a block structure picture, Zach now played with Kid K'Nex® where he built a character while looking at a picture of a character. Locations used in teaching consisted of a Dora the Explorer® suitcase, a Go Diego Go™ suitcase, two Rubbermaid® Latchabels™ boxes

42.4 x 27.9 x 17.5 cm, one box was covered in green construction paper and one box was covered in red construction paper.

Chris' activities consisted of foam blocks, cars (Fisher Price® Shake'N Go® cars, Chuck and Friends Highway Fleet™, Tonka® Chuck Fold'N Go Garage™), and Thomas and Friends™ train tracks and engines (*CMEO 1, hide-and-seek*), MB® Memory® game, spelling words with plastic letters, and puzzles (*CMEO 2, missing item*), bubbles (soap, wands, Gazillion® bubble BBQ etc), making a volcano (narrow vase/bottle, food colouring, baking soda, vinegar), and stacking pillow high, letting him sit on them, and fall over on his bed (*CMEO 3, requiring more*), and a Robert Munch book, a BlackBerry®, and metal spinning top (*CMEO 4, surprise*). Chris' locations used during teaching sessions were 2 Rubbermaid® boxes 61 x 40 x41 cm. One box was purple and the other was green. Also used was one large blue folding travel bags 76 x 38 x 33 cm.

Connor's activities consisted of sand play (sand, pail, shovel, moulds, etc), water play (e.g., boat, fish, shark, Squirts™ bath toys), and cars (Fisher Price® Shake'N Go® cars, Chuck and Friends Highway Fleet™, Tonka® Chuck Fold'N Go Garage™) and wood blocks (*CMEO 1, hide-and-seek*), Imaginarium Deluxe Marble Race, drawing (white board, dry erase markers, Aquadoodle™ Draw'N Doodle™), shape sorters (little tikes® basic trainer™ MC Playskool® busy basic™ form fitter™ *CMEO 2, missing item*), bubbles (soap, wands, Gazillion® bubble BBQ), making a volcano (narrow vase/bottle, food colouring, baking soda, vinegar), and decorating a cupcake (cupcake, icing, sprinkles, *CMEO 3, requiring more*), and banana chips, plastic animals, and foam letters (*CMEO 4, surprise*). Connor's locations were two Sterilite® boxes 41.9 x 33 x 16.8 cm. Green construction paper was placed on one of the boxes and red construction paper was placed on the other box. Also used was one large blue folding travel bags 76 x 38 x 33 cm.

CMEO 4, Surprise. For this CMEO, a wooden box with a small padlock, and three fabric boxes measuring 30.5 x 30.5 x 30.5 were used.

Generalization Materials

A novel preferred activity was selected for the generalization assessment. This activity was chosen from the list of activities that the parents provided, and was an activity that could be done with each CMEO. For Zach and Chris, this consisted of baking cookies or other goods, for Connor it consisted of making pudding. The location used in generalization for Zach was a Sterilite® 2 drawer cart 36.2 x 21 x 41 cm. Yellow construction paper was placed on the front of one drawer and blue construction paper was placed on the front of the other drawer. The location used in generalization for Chris and Connor was a Sterilite® 2 drawer cart 36.2 x 21 x 41 cm. White construction paper was placed on the front each drawer. A black paper circle was placed on the front of one drawer and a black paper square was placed on the front of the other drawer. The presentation of the drawers was randomized. Also for all participants a wrapped shoebox was used during the generalization task. During the observation in the natural environment, toys and items used in the child's every day routine were used.

A video camera was present for most sessions during each phase of the study.

Research Design

A modified multiple-baseline across participants was used to evaluate the teaching package. Baselines across all CMEOs and generalization probes (novel activity/location; natural environment observation) were conducted for two participants (Zach and Chris) prior to the commencement of any teaching. Connor was recruited late therefore his initial baseline assessments occurred while Zach was learning the mand "Where?" After baselines were administered with Zach and Chris, teaching then began with the first participant (Zach). Once Zach met the mastery criterion, generalization probes (novel activity/location; CMEOs, and natural environment observation) were administered for him and baseline assessments were conducted for Chris and Connor. Teaching then began for Chris. Once Chris met the mastery

criterion, generalization probes (novel activity/location, CMEOs, natural environment observation) were administered to Chris, and baseline assessments were conducted for Connor. Teaching then began with Connor. Once Connor met the mastery criterion, generalization probes (novel activity/location, CMEOs, natural environment observation) were conducted for him.

Procedure

Assessments Prior to the Study

To ensure that the participants who did not participate in Experiment 1 could respond to an echoic prompt, a pre-teaching assessment of 20 trials of the words "What", "Where", "Which one", and "Who" (five trials per word) were presented to Chris and Connor to see if they could echo the words (for Zach this had been administered prior to teaching the mand "What?"). Teaching only began if a participant was able to echo these words 90% - 100% of the time. For both Chris and Connor, this criterion was met after one administration. Pre-teaching assessments also occurred to ensure that the participants could go to the correct location. This consisted of presenting all three locations (e.g., one of the boxes, one of the bags, and one of the drawers) in the room. The participant was told to "Go and get what is inside the (name of container)" (e.g., "Go get what is inside the bag"). If the participant opened the correct container, praise was given and he could play with the toy found for approximately 30 s to 2 min. If the participant went to the incorrect location, his response was blocked (i.e., the experimenter did not allow him to open the container), the instruction was re-presented (e.g., "Go get what is inside the bag"), the experimenter pointed to the correct container, and once the participant touched the correct container, non-enthusiastic praise (e.g., "good") was given. The participant did not get access to the toy inside. Each location was presented 5 times for a total of 15 trials. Teaching began when the participant was able to go to the correct location 90-100% of the time. Zach and Chris required one administration to meet the criterion, Connor required two.

Baseline Phases Prior to Teaching the Mand

Baselines were administered prior to teaching, and were re-administered with participants who had not undergone teaching, after a participant who had undergone teaching met the teaching mastery criterion.

Baseline in the natural environment. A baseline of the frequency that a participant used the mand "Where?" in the natural environment was conducted in the same fashion as for the mand "What?" except that opportunities were contrived differently. The first way was by using a vocal script (e.g., "Get the marbles", before starting a Hungry Hungry Hippos Game®). Five vocal scripts were given to the parents and the parents were asked to use one at least once (see Table 6). Parents were permitted to use as many scripts as they wanted and they could also use novel ones not listed. The second way was by having an item that their child needed or wanted hidden in an unknown location without saying anything (e.g., When eating supper the fork was hidden). When assessing the mand "Where?" the parents were asked to interact with their child as they normally would while contriving opportunities. Commonly chosen activities for Zach were eating, playing with toys, practicing a piano, and doing crafts. Commonly chosen activities for Chris were playing with toys and games. Commonly chosen activities for Connor were eating meals, playing with toys, using a computer, and daily routines such as getting dressed to go outside.

Parents interacted with their child for one hour or until 10 opportunities to mand had been given (whichever came first). Rules given to the parents were the same as in Experiment 1 with the following exceptions; (a) if the child did not respond within 15-30 seconds, parents were instructed to tell him the location of the item or give him a hint (e.g. "It's somewhere in the kitchen") (b) if the child asked "Where?" parents were instructed to tell him where the item was hidden, and (c) other family members could be present (for Connor we decided to not allow his sister to participate as she asked the questions we were assessing before he did). When necessary

Table 6.

Natural Environment Observation Scripts Given to the Parents for the Mand "Where?"

Type of Script	Script
Vocal Script	1. Get the/my _____ 2. I know where we should go 3. I remember where I put it 4. I know where we can look 5. Go look for the _____
No Script	6. Something the child wants/needs for an activity is missing (don't ask anything)

Table 7.

Samples of the Mand "Where?" that were Considered Correct and Incorrect

Mand	Sample of correct responses	Sample of incorrect responses
Where	Where Where is it Where did it go Where is _____ (Names item, names item) Where is (item)	Wheee What, which one, who (names the item more than 6 times) Whered

the experimenter would give examples of ways in which the parents could contrive opportunities. During the observation, the experimenter did not participate in any of the activities, and interactions were limited to answering the parent's questions, and when only one type of opportunity had been contrived asking parents to contrive an opportunity in a certain way.

If the participant manded "Where?" this was noted as a spontaneous mand. Spontaneous mands were considered correct if they contained the word "Where?" (e.g. "Where did it go?", "Where is it?", "Where's my ___", see Table 7). If the participant missed an opportunity to mand, this was noted as a missed opportunity. A missed opportunity was defined as when the participant unsuccessfully searched for an item that was needed, and a request for more information by asking "Where?" would have been appropriate, and the participant failed to mand appropriately to get more information. It was also defined as when the parent asked the child to get/find/look, etc. for something and upon unsuccessful searching the parent gave the child additional information in order for the child to find the item. In addition, each time that a parent used a different script this was considered a new opportunity. If the parent used one script, the participant asked "Where?" and the same script was used 2 – 3 s later, then this was also considered a new opportunity. If the same script was used within 10 s (e.g., the parent said "Go get the marbles….. go get the marbles") and the child did not mand in between, then it was only considered one opportunity (rather than two). The following situations were not scored as successful or missed opportunities; (a) a participant found the hidden item, (b) a participant used the target mand in an inappropriate way, and (c) a sibling used the mand and the participant immediately repeated what the sibling said. Natural environment observations produced two scores, the percentage of the spoken mand "Where?" when (vocal) scripts were given, and the percentage of the spoken mand "Where?" when scripts were not given. Scores were calculated by dividing the number of spontaneous mands by the number of spontaneous mands and missed opportunities and multiplying by 100%.

Baselines of CMEOs. Prior to the commencement of teaching, three baseline trials for each CMEO were administered, one for each of the three activities that were used in teaching. If a participant correctly manded across each of the three baseline trials in each CMEO, then this mand was considered acquired and was not taught. A baseline trial consisted of approaching the participant or beginning the activity (as described later in the description of the CMEOs). A preferred item was hidden during the course of the activity or prior to beginning the activity. If the participant correctly manded, then the answer to his question was given and the participant was permitted to retrieve the item and continue the activity. If the participant did not mand "Where?" after approximately 10-15 s, then the trial was terminated, the activity ended, the participant was not told where to find the item, and an error was scored.

Baselines of a novel activity and location not used in teaching. A novel activity and location (not one used during the teaching sessions) were incorporated in a generalization baseline. A total of four trials were contrived, and each trial was contrived in a similar fashion to each of the four CMEOs. If a participant emitted the correct mand, then the answer to his question was given and the activity continued. If the participant made an error or did not respond within 10-15 s, he was not told the location of the item, the experimenter waited 5 s, then she casually took the item needed to continue the remainder of the probes. The item was not mentioned and attention to the item was not given (e.g., "oh here is the missing spoon" was not said).

The following is an example of how the activity of making pudding was administered. The experimenter approached the participant and gave him a present. The participant opened the present, however the present was empty (*CMEO 4, surprise*). If the participant manded "Where?" the experimenter said "It's in the drawer" and the participant was permitted to go to the drawer to retrieve the item. If the participant failed to mand "Where?", the pudding package was casually brought to the counter. The package was opened and emptied into the bowl. Then the experimenter

took out a measuring cup and said "We need 2 cups of milk". The milk was poured into the

measuring cup, however there was not enough milk to fill up the cup (*CMEO 3, requiring more*).

If the participant manded "Where?" he was told "It's in the drawer" and the participant was

permitted to retrieve the item. If the participant failed to mand "Where?", the experimenter

casually took the milk and poured it into the bowl. Then the mixer was plugged in however the

beaters were missing (*CMEO 2, missing item*). If the participant manded "Where?" he was told

"It's in the drawer" and was permitted to retrieve the item. If the participant failed to mand

"Where?" the experimenter casually got the beaters from the drawer and put them on. After the

pudding was done, a small portion was put into a bowl for the participant to eat. The participant

was asked to get a spoon, and while the participant went to get a spoon, the bowls of pudding were

hidden (*CMEO 1, hide-and-seek*). Once the participant returned with the spoon, if he manded

"Where?" he was told "It's in the drawer" and was permitted to retrieve the pudding and consume

it. If the participant failed to mand "Where?", the activity was terminated.

Teaching Phase

The teaching procedure consisted of four components: (a) contrived CMEOs, (b) constant

prompt delay and prompt fading, (c) natural consequences for responding, (d) error correction and

(e) a brief preference assessment.

Contrived CMEOs. The four CMEOs were: (a) *hide-and-seek*, (b) *missing item*, (c)

requiring more, and (d) *surprise*. Four teaching trials were administered in one teaching session;

two trials were administered for each activity (unless the participant asked to change activities

before the second trial could be administered). Two locations (e.g., one box and one bag) were

placed near the participant and experimenter. The mastery criterion was met when the participant

emitted seven correct independent target mands across two consecutive teaching sessions in a

CMEO. Four data sheets with randomized order of the locations were used, one per session. Only

CMEO 1, hide-and-seek and *CMEO 2, missing item* were exposed to the teaching procedure, therefore only these CMEOs will have an example in the section below of how the mand "Where?" was taught. For the other CMEOs, examples of how the baseline and generalization assessments were conducted are given. Please note that the training procedure (prompting, reinforcement, and error correction) is described in the next section.

CMEO 1. Hide-and-seek. In *CMEO 1,* the experimenter and the participant began by doing an activity. The toy from the activity that the participant played with the most was the toy that was hidden. Once the item was hidden the experimenter waited until the participant began searching. Then the prompting procedures described later commenced. The following is an example of teaching the mand "Where?" with one of the activities. While playing with the cars and blocks the participant kept picking up and playing with one of the Shake'N Go® cars. When the participant was not looking, the experimenter hid the car. When the participant noticed that the item was missing (e.g., began searching, named the item) the participant was prompted to say "Where is it?" (Chris), or "Where did it go?" (Zach), or "Where is (item)?" (Connor). Once the participant responded to this prompt, the experimenter said, "It's in the bag" and the participant was permitted to retrieve the item and continue the activity.

CMEO 2. Missing item. In *CMEO 2,* an item needed to complete an activity was hidden before presenting the activity and out of sight of the participant (only Connor was exposed to teaching in this CMEO). Once the item was hidden, the experimenter and the participant began by doing the activity. Once the participant noticed that something was missing (e.g., looked around) the prompting procedure described later commenced. The following is an example of teaching the mand "Where?" with one of the activities. Shapes to a shape sorter were hidden before presenting the shape sorter. Once the participant noticed (e.g., searches, names the item) that the shapes were missing the participant was prompted to say, "Where (item)?" Once the participant responded to

this prompt the experimenter said, "It's in the box" and the participant was permitted to retrieve the item and continue the activity.

   CMEO 3. Requiring more. In *CMEO 3,* a small amount of one item needed to complete one of the activities was included with the other materials for that activity. Then the experimenter and the participant began completing the activity. The following is an example of the baseline and generalization assessments of the mand "Where?" with one of the activities. While making a volcano, only a small amount of vinegar was provided resulting in the volcano failing to erupt. If the participant asked "Where?" the experimenter said, "It's in the bag" and the participant was permitted to retrieve the item and continue the activity. If the participant failed to mand "Where?", manded anything but "Where?", or tried to open all the containers, this response was blocked and scored as an error, the trial was terminated, and the participant did not get access to the hidden item.

   CMEO 4. Surprise. In *CMEO 4,* the mand was contrived in two different ways. The first way consisted of taking an item that the participant had chosen to play with and placing it in a box, then locking the box, while the participant watched. The participant was then given the locked box (but not the key). The second way consisted of placing three fabric boxes, turned upside down, in front of the participant. While the participant watched, the item that he had chosen was placed under one of the boxes. The participant then was able to retrieve the item. This was repeated a few times. Then the experimenter pretended to place the activity/item under one of the boxes or the item was placed under one the boxes and then the participant was blind folded. While the participant was blindfolded the item was hidden in one of the locations (e.g., in the suitcase). The following is an example of the baseline and generalization assessments of the mand "Where?" with one of the activities. Letters that the participant chose to play with were placed in a box, then the box was locked while the participant watched. The key was hidden, in the bag, out of sight of

the participant. If the participant asked "Where?" the experimenter said, "It's in the bag" and the participant was permitted to retrieve it. If the participant failed to mand "Where?", manded anything but "Where?", or tried to open all the containers, this response was blocked and scored an error, the trial was terminated and the participant did not get access to the hidden item (see Appendix D for a description of each of the CMEOs).

Constant prompt delay and prompt fading. Prompts were delivered after 10-15 s of no responding (constant prompt delay). A full prompt consisted of telling the participant the entire response (i.e., "say Where is it?"). A partial prompt consisted of telling the participant a part of the answer (e.g., "Where", "Whe", "Wh"). Teaching began with a full prompt (e.g., "say Where is it"), which was faded to a partial prompt (e.g., "Say whe") across trials. As the participant successfully responded to prompts the type of prompt was faded more and more (e.g., "Say wh"). The criterion for fading to a lesser prompt was if the participant correctly responded to the preceding prompt across two consecutive trials. The prompt regressed to a greater prompt if the participant did not respond to the partial prompt on any given trial.

For Connor textual prompts were also used. The textual prompts consisted of having a card with the word "WHERE" on it (e.g., taped on the marble race). Prior to a session Connor was shown the card and asked to read it. Once Connor correctly read the card 3 times the session began. The textual prompt was faded over 5 steps. On the first step, a card measuring 10.06 x 15.98 cm and containing the word WHERE in black (font size 120) was presented. On the second step, a card measuring 7.96 x 13.98 cm and the word WHERE in dark gray (font size 90) was presented. On the third step, a card measuring 5.96 x 11.58 cm and the word WHERE in gray (font size 60) was presented. On the fourth step, a card measuring 3.96 cm x 9.98 cm and the word WHERE in pale gray (font size 30) was presented. On the fifth and final step a card measuring 1.96 x 7.98 cm and the word WHERE in very pale gray (font size 10) was presented. If Connor

responded by asking "Where?" with the card present, it was scored as a partial prompt. The

advancing criterion to move from one step to another consisted of at least of two consecutive

correct trials of correct responding in the presence of the card at a step. The regression criterion to

return to a previous step was two consecutive errors on a step. Appendix F illustrates the textual

prompt cards used across steps. The prompt delay was not used when the textual prompt was in

place.

Natural consequences for correct responses. If a participant emitted the correct mand (see

Table 7) at the correct time, the answer to his question was given (e.g., "It's in the box") and the

participant was permitted to retrieve the item. Programmed reinforcers such as tokens and praise

were not provided following the occurrences of the mands.

Error correction. If a participant made any response other than the correct mand then an

error correction was delivered. The error correction consisted of re-presenting the trial and

prompting the response using the type of prompt that would ensure success. Once the participant

responded correctly to the prompt, the location of the hidden item was named.

Preference assessment. The activities were chosen in the same fashion as in Experiment 1.

The preference assessment was conducted in the same fashion as in Experiment 1.

Post-Assessments

Post-assessments occurred once a participant met the mastery criterion in the teaching

phase.

Generalization to the natural environment. Upon mastery of a CMEO, the participant was

observed during approximately 1-hour or 10 opportunities (whichever came first) in the natural

environment. This observation was conducted in the same fashion as in the baseline phase. The

definition of a successful mand and missed opportunity as well as the scoring method were the

same as in baseline.

Generalization to a novel activity and location. After mastery, a novel activity containing 4 trials (one from each CMEO) was presented to the participant. Those were administered in the same way as in baseline.

Generalization across CMEOs. The procedure was identical to the baseline of the CMEOs. Three baseline trials for each CMEO were administered, one for each of the three activities that were chosen for that CMEO.

Follow-up. One, two, and four-week follow-ups were administered in the CMEOs that had undergone the teaching procedure. The three activities used in teaching were presented to the participant and he was given the choice of which activity he would like to complete. The follow-up procedure was the same as the baseline procedure except only one trial was administered. See Table 8, for a summary of the assessments done during each phase.

Reliability and Validity

Inter-observer reliability (IOR). IORs were conducted as described in Experiment 1.

For Zach, IORs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 87% of the teaching sessions, 100% of the generalization assessments and follow-up, and 100% of the natural environment observation. Average IORs were 100% for the pre-teaching sessions, 100% for CMEO assessments, 96% for teaching sessions (average 75-100%), 100% for generalization assessments and follow-up, and 88% (range 75-100%) for the natural environment observations.

For Chris, IORs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 50% of the teaching sessions, 83% of the generalization assessments and follow-up, and 67% of the natural observation assessment. Average IORs were 100% for the pre-teaching sessions, CMEO assessments, and the teaching sessions, generalization assessments and follow-up and 90% (no range) for the natural environment observations.

Table 8.

Summary of the Assessments Done During Each Phase of Experiment 2

Phase	What needs to be done	Number of trials
Prior to baselines or teaching	Echoic test	20 (5 trials for each of the following words, what, where, which one, who)
	Location test	15 (5 trials for each of the 3 locations)
When a participant meets the mastery criterion	Natural environment Observation Generalization to the novel activity and location	10 opportunities or 1 hour 4 (one trial for each CMEO)
	Assessment of the unlearned CMEOs	3 trials for each unlearned CMEO
	Follow-up	1 trial for each time period (1-week, 2-week, 4-week)
Before beginning teaching	Natural environment Observation	10 opportunities or 1 hour
	Generalization to the novel activity and location	4 (one trial for each CMEO)
	Assessment of the unlearned CMEOs	3 trials for each unlearned CMEO
	Follow-up	1 trial for each time period (1-week, 2-week, 4-week)

For Connor, IORs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 91% of the teaching sessions, 100% of the generalization assessments and follow-up, and 57% of the natural environment observations. Average IORs were 100% for the pre-teaching sessions, 100% for the CMEO assessments, 99% (range 75-100%) of teaching sessions, 100% of the generalization assessments and follow-up, and 95% (range 90-100%) of the natural environment observations.

Procedural reliability (PR). PRs were completed as described for Experiment 1.

For Zach, PRs were taken for 100% of the pre-teaching sessions, 71% of the CMEO assessments, 75% of the teaching sessions, 100% of the generalization assessments and follow-up, and 67% of the natural environment observations. Average PRs were 100% for the pre-assessment, 98% (range 92-100%) for the CMEO assessments, 97% (range 83-100%) for teaching sessions, 100% for generalization and follow-up, and 100% for the natural environment observations.

For Chris, PRs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 50% of the teaching sessions, 83% of the generalization assessments and follow-up, and 67% of the natural environment observations. Average PRs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations.

For Connor, PRs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 91% of the teaching sessions, 100% of the generalization assessments and follow-up, and 57% of the natural environment observations. Average PRs were 97% (range 93-100%) for the pre-teaching sessions, 100% for CMEO assessments, 99% (range 90-100%) of teaching sessions, 100% for generalization assessments and follow-up, and 100% of the natural environment observations.

Procedural integrity (PI). PIs were conducted as described for Experiment 1.

 For Zach, PIs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 86% of the teaching sessions, 100% of the generalization assessments and follow-up, 100% of the natural environment observations. Average PIs were 100% for the pre-assessment, CMEO assessments, teaching sessions, generalization assessments, and follow-up, and natural environment observations.

For Chris, PIs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 50% of the teaching sessions, 83% of the generalization assessments and follow-up, and 67% of the natural environment observations. Average PIs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations.

For Connor, PIs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 96% of the teaching sessions, 100% of the generalization assessments and follow-up, and 57% of the natural environment observations. Average PIs were 100% for the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessment and follow-up, and natural environment observations (see Appendix G to see a copy of the data sheet that were used).

Social validity. Social validity assessments were conducted as described for Experiment 1.

Results and Data Analysis

During baseline assessments, Zach, did not use the mand "Where?" correctly across any of the CMEOs, during the novel activity and location (see Figure 7, top panel), or during the natural environment observation (see Figure 8 top panel). While, Zach was learning to ask "Where is it?" during the initial teaching sessions, he began asking "What is it?" instead of "Where is it?" Given that he had already learned to ask "What is it?" and this response had a similar topography to "Where is it?' it was decided that Zach would now learn to ask "Where did it go?" This began to
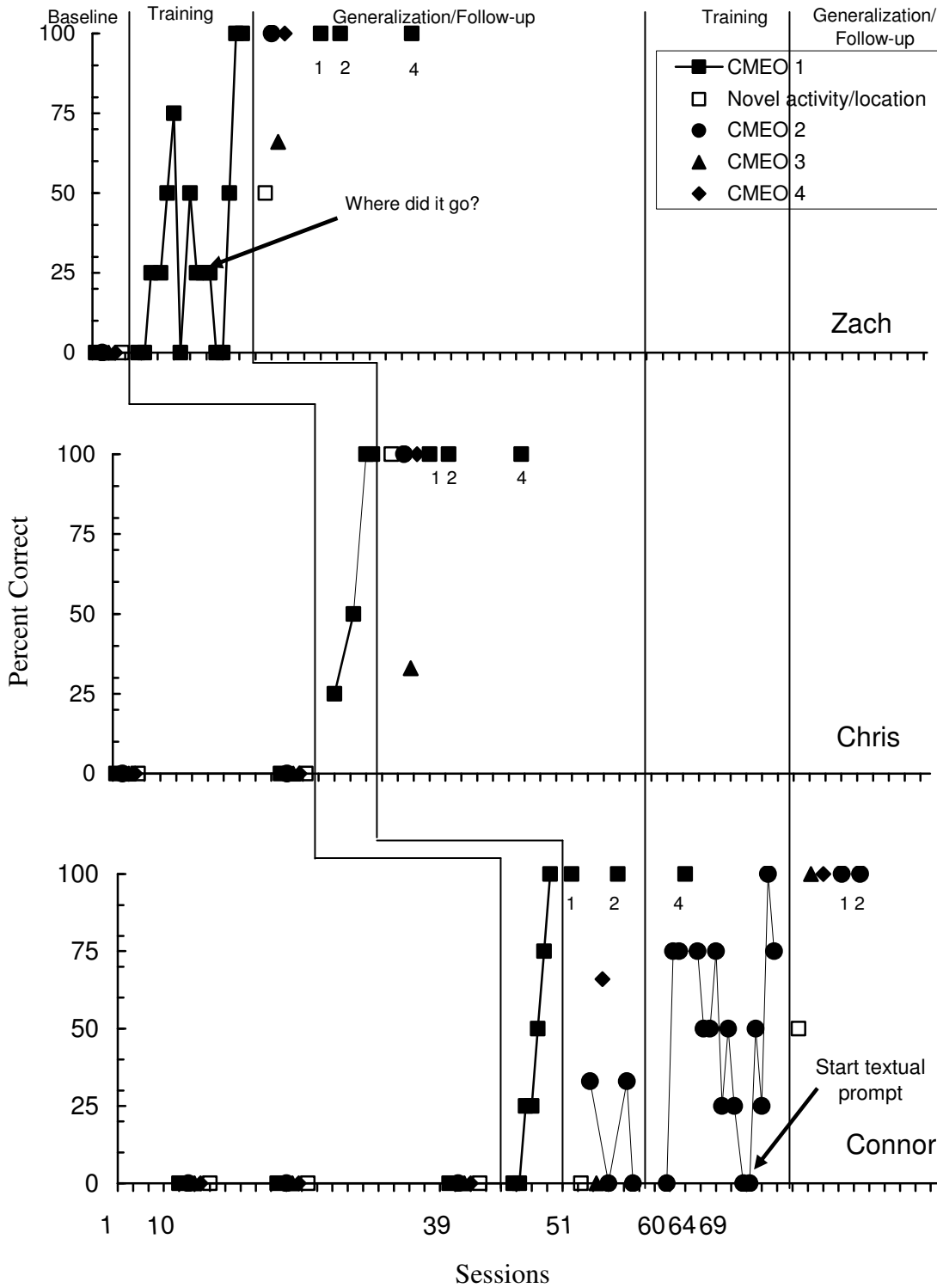
Figure 7. Results across participants for the mand "Where?" Numbers indicate the 1, 2, and 4 week follow-up results.
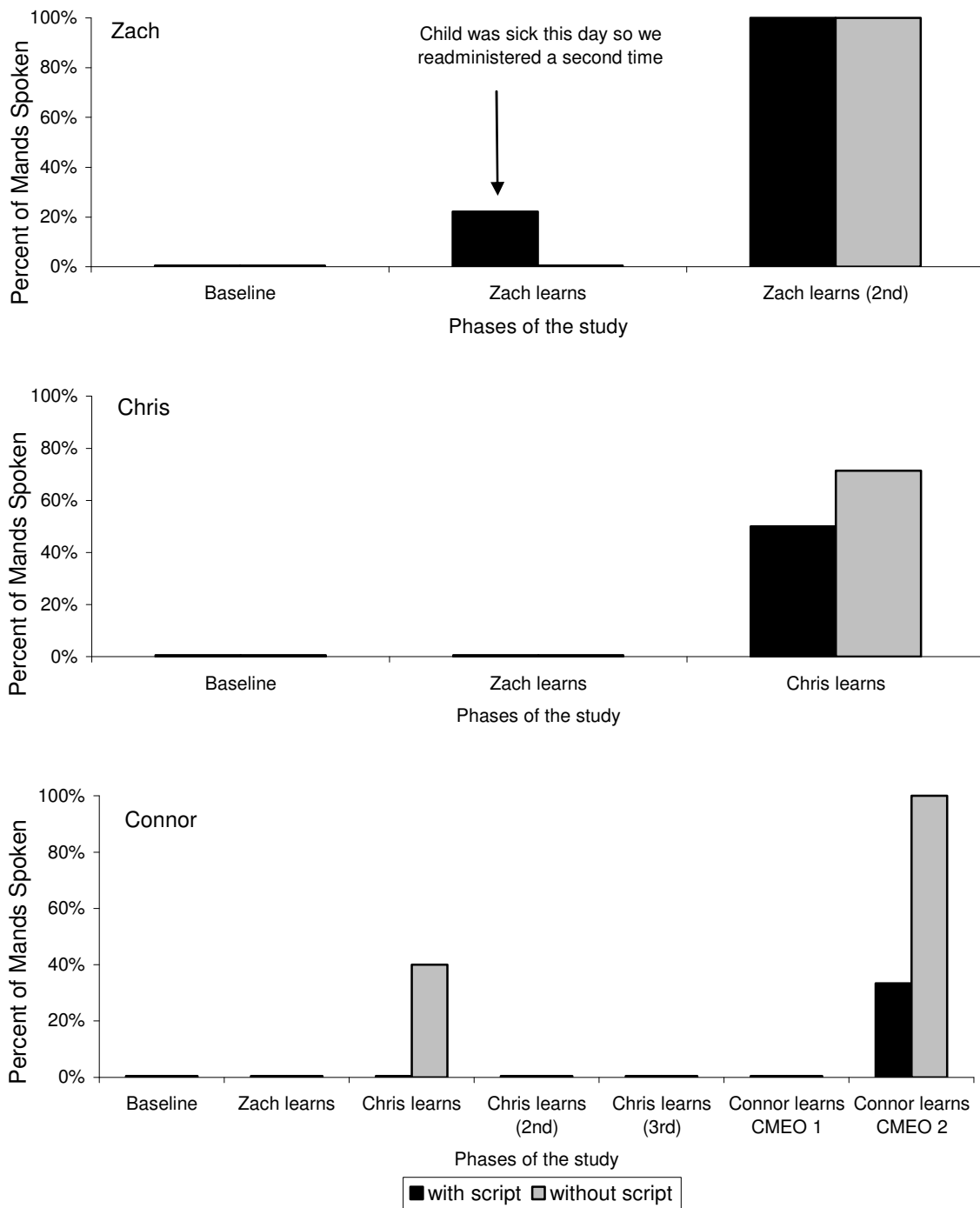
Figure 8. Results of the spontaneous mand "Where?" during the natural environment observation. Black bars indicate when the parents gave a vocal script, gray bars indicate when the parent did not give a vocal script.

occur at teaching session 10 (session 16 overall); however if he said "Where is it?", this was also counted as correct. Overall Zach learned the mand "Where did it go?" after 16 sessions and 64 trials (see Figure 7, top panel). Upon mastery, two natural environment observations were conducted. After the first natural observation, we were informed that Zach had been sick throughout the night. Therefore we conducted a second natural environment observation; Zach manded "Where did it go?" 100% of the time with and without scripts (see Figure 8 top panel). Generalization to the novel activity and location was also assessed, and Zach manded 50% (2/4) of the time correctly (see Figure 7). Upon mastery generalization assessments were conducted to the untrained CMEOs, and Zach manded 100% of the time in CMEO 2 and 4, and 66% (2/3) of the time in CMEO 3 (see Figure 7). His parents also reported hearing Zach use the mand outside of engaging in an activity. For example, one morning Zach went into his parents' room and asked his Dad, "Where did mom go?" (his mom had left for an errand that morning). During the one-week, two-week, and four-week follow-ups, Zach continued to use the mand "Where did it go?" appropriately (see Figure 7 top panel).

        During baseline assessments, Chris did not use the mand "Where is it?" correctly across any of the CMEOs, novel activity/location (see Figure 7, middle panel), or in the natural environment (see Figure 8, middle panel). Chris learned to use the mand "Where is it?" after 4 sessions and 16 trials. During the natural environment observation, Chris manded "Where is it?" 50% of the time appropriately with scripts and 71% of the time without scripts (see Figure 8, middle panel). After mastery, with the novel activity and location, Chris manded "Where is it?" 100% of the time. Chris manded correctly in CMEO 2 and 4 100% of the time and 33% (1/3) in CMEO 3 (see Figure 7). It should be noted that approximately 4 months after mastery we returned to do a baseline for the mand "Which one" and Chris manded "Where is it?" in CMEO 3 100% of the time. Up to four weeks after mastery Chris continued to mand. Four months later when we

returned Chris was heard using variations of the mand "Where?" For example, rather than always manding "Where is it?" he was also heard to mand "Where the bubbles go?"

During baseline assessments, Connor did not use the mand "Where is (item)?" correctly across any of the CMEOs, during the novel activity and location (see Figure 7, bottom panel), or during the natural environment observation. On the third baseline administration, Connor's natural environment score increased to 40% (see Figure 8, bottom panel). His parents reported that they had heard him mand "Where is (item)?" in very specific situations (when the mouse to the computer was hidden and when he could not find a certain toy). We then re-administered the natural environment baseline two more times (both included the two situations mentioned above), but Connor did not use the mand "Where is (item)?" during the last two baseline administrations. Teaching then began in CMEO 1, Connor learned to use the mand "Where is (item)?" after 7 sessions and 28 trials (see Figure 7, bottom panel). Following mastery of CMEO 1, in the natural environment, Connor failed to mand "Where is (item)?" correctly during any of the opportunities (see Figure 8, bottom panel). He also failed to mand with the novel activity and location. When presented with the activities in CMEO 2, Connor manded 33% of the time, in CMEO 3 he failed to mand (0/3), and in CMEO 4, he manded 66% of the time (see Figure 7). Baselines of CMEO 2 were conducted 3 more times, and once a stable baseline was reached teaching began in CMEO 2 (creating a multiple baseline across CMEOs – see Martin and Pear 2007). Connor initially made progress; however, over time his articulation of the mand became less clear. We then introduced a textual prompt during teaching session 11 (session 70 overall). As described previously, the textual prompt contained five steps. Once all five steps were faded, Connor learned the mand in 4 sessions. Overall Connor learned the mand "Where is (item)?" in CMEO 2 in 16 sessions and 64 trials (see Figure 7). Following mastery with CMEO 2, during the natural environment observation, Connor manded 33% of the time with the vocal script and 100% of the time without

the vocal script (see Figure 8, bottom panel). Connor manded 50% of the time with the novel activity and location and 100% of time in CMEOs 3 and 4. His parents reported hearing Connor use variations of the mand "Where?", for example he would say "Where is my other boot?" Connor manded "Where is (item)?" in CMEO 1, up to four weeks after mastery. One and two week follow-ups were conducted for CMEO 2 and Connor correctly used the mand "Where is (item)?" both times (see Figure 7). A 4-week follow-up was not administered as baselines for the mand "Which?" (see Experiment 3) were being conducted.

Prior to beginning the study, parents and ABA consultants were asked to rate two questions relating to the importance teaching WH questions to their child/client and the importance of WH questions as a language or communication skill on a 5-point scale. For Zach, Chris, and Connor both their parents and ABA consultants strongly agreed with both statements. Upon completion of the study, parents and consultants were asked how much they agreed with six statements relating to the goal of teaching "Where?" and the satisfaction of the teaching procedure and results. On average Zach's mother's score averaged was 4.8 and his consultant's score averaged was 4.1, Chris' mother's and consultant's scores averaged 5, and Connor's mother and consultant's scores averaged were 4.7 and 4.3 respectively. Therefore overall parents and consultants were satisfied (see Table 9).

<div align="center">Discussion</div>

All three participants learned to mand "Where?" and generalization occurred partially or fully to the natural environment, with a new activity and location, and across time. However, differences in performance were noted. First, Zach required many more teaching trials prior to reaching the mastery criterion in CMEO 1 compared to Chris. Particularly, Zach required 64 trials before reaching the mastery criterion in CMEO 1. Zach began using the mand "What is it?"

Table 9.

Results of the Social Validity Questionnaire on a Scale of 1 (strongly disagree) to 5 (strongly agree) for

the Mand "Where?"

Questions	Zach		Chris		Connor	
	Parent	Consultant	Parent	Consultant	Parent	Consultant
1. I thought the goal of teaching my child/client to request information using "Where is it?" (or variations of) was an important goal for him/her.	5	4	5	5	5	5
2. I found the teaching procedure to be acceptable	4	4	5	5	5	5
3. I was satisfied with the efforts made to teach my child/client to request information by asking "Where is it?" (or variations of).	5	5	5	5	5	5
4. I have observed my child/client requesting information by asking "Where is it?" (or variations of) appropriately and more frequently.	5	4	5	5	3	4
5. I would be willing to use this teaching procedure again to teach my child/client other skills (e.g., other WH questions).	5	4	5	5	5	5
6. I think that the ability to request information by asking "Where is it?" is an important language and communication skill.	5	4	5	5	5	5

(learned in Experiment 1) rather than "Where is it?" Given that both responses have a similar topography it was decided to teach Zach the mand "Where did it go?" Second, Connor quickly learned to mand "Where is (item)?" in CMEO 1, however he required numerous trials to meet the mastery criterion in CMEO 2. A possible reason why teaching did not occur as rapidly is that Connor's articulation was at times poor and over sessions became much less clear than when teaching in CMEO 1. Reinforcement of poor quality responses may have shaped inappropriate responding. A textual prompt was introduced to prompt the correct response. It took 2.5 sessions to fade out the textual prompt, and once the textual prompt was faded, mastery was quickly reached. Third, generalization to the natural environment occurred for Zach and Chris after mastery in CMEO 1 but Connor required mastery in two CMEOs before generalization to the natural environment occurred, a possible reason for this may be that Connor's language skills were weaker. Both Zach and Chris received higher scores on the PLS-4 and both had stronger intraverbal skills. Fourth, Chris performed better overall compared to Zach and Connor. Again this may be due to the fact that Chris had stronger language skills compared to the other two. Chris's standard scores for the PLS were within the average range or one standard deviation below the average range. Zach and Connor on the other hand had standard scores falling two or more standard deviations below the average range.

Similarities across participants were also noted. First, participants manded "Where?" more frequently in the natural environment when scripts were not provided versus when scripts were provided. This is likely due to the fact that the way in which opportunities without scripts were contrived more closely resembled the way in which the opportunities during teaching were contrived. Second, a similarity in results for Zach and Chris is that generalization to the novel activity and location occurred on 100% of trials for CMEOs 2 and 4 but weaker generalization occurred for CMEO 3. During CMEO 3, for Zach the experimenter noted that he was fearful of

one of the bubble toys and asked for it to be put away, and he showed a low interest in playing

with bubbles after that. For Chris the experimenter noted that he interacted with the toy in different

ways that did not require more of one of the items. Chris placed his face over the bubble machine

and seemed to enjoy the air blowing on his face and hair. This may have decreased his motivation

to request the needed item.

Overall, the findings are consistent with previous research. Results are similar to the Betz

et al. (2010) study in that, when teaching without the use of vocal scripts, generalization to the

natural environment emerged. Prompting, reinforcement, and contrived CMEOs were used and

found to be successful in increasing mands in this study as well as other studies (e.g., Betz et al.;

Endicott and Higbee, 2007; Lechago et al., 2010; Sundberg et al., 2002). Faster generalization to

untrained CMEOs occurred in the present study compared to the Roy-Wsiaki et al. (in press) study

when teaching "What is it?" Limitations of this experiment are discussed later in the Overall

Summary.

EXPERIMENT 3. TEACHING CHILDREN WITH AUTISM TO MAND "WHICH?"

Statement of the Problem

The purpose of Experiment 3 was to teach three children with autism to use the mand

"Which?" The teaching procedure consisted of the same components as Experiment 2. Upon the

successful acquisition of the mands, tests for generalization were conducted. It was predicted that:

(a) the participants would learn to use the mand "Which?", (b) generalization to novel contrived

CMEOs, and successful follow-up would occur, and (c) there would be an increase in the

frequency of the learned mand to the natural environment.

Method

Participants and Setting

The participants were recruited from the St.Amant ABA program for Children with

Autism. The inclusion criteria consisted of children who: (a) could mand for basic items

(Sundberg et al., 2002), (b) could tact (Sundberg et al., 2002) (c) were able to communicate using

some type of communication system (e.g., sign language, pictures, talking device, speaking), and

(d) had an expressive and receptive language age-equivalence of at least 24 months.

Participants were excluded if they: (a) did not display the above-mentioned skills, (b)

currently used the mand "Which?" during the baseline assessments, or (c) displayed challenging

behaviours (e.g., tantrums, aggression, destruction to property) across several sessions lasting

more than 10 minutes that interfered with the teaching sessions. Chris was excluded as he was able

to correctly emit the mand "Which?" during the baselines of our teaching task.

Zach who participated in Experiment 1 and 2 also participated in Experiment 3. He was 5-

years old at the time of Experiment 3. He was taught the mand "Which one?"

Kevin who participated in Experiment 1, also participated in Experiment 3. Kevin was 6-

years old at the time of Experiment 3. He was taught the mand "Which one?"

Connor who participated in Experiment 2 also participated in Experiment 3. He was taught the mand "Which (location)?" (e.g., "Which box?").

Teaching sessions took place in each participant's home. Various rooms of each house were utilized to accommodate the activities and promote generalization.

Apparatus

Tests and Questions

Tests and questions were the same as in Experiments 1 and 2.

Teaching Materials

CMEO's were contrived as done by Roy-Wsiaki et al. (in press). In order for CMEOs to be contrived, preferred activities and known locations as reported by the parents in the pre-assessment questionnaire were used. For each of the four CMEOs, three activities were chosen. Prior to trials 1 and 3 the participants were given a choice of which of the activities they would like to complete. Before teaching, I had planed that if a participant appeared uninterested (e.g., said he did not want to play, walked away) in an activity identified by the parents, then a different activity was to be selected and tried. This did not happen for any of the participants. If the participant began to lose interest in certain activities due to the long nature of the study, variations of that activity were introduced. For example, different water toys were included in Connor's water play activity such as soap, water guns, water balloons, etc. Participants responded well to this and motivation to use the mand "Which?" was present throughout.

Zach's activities were the same as in Experiment 2. Locations used in teaching were the same as in Experiment 2 and a piano bench, a child-size coat, a cabinet, two child-size backpacks, and two reusable grocery bags were also used.

Kevin's activities were the same as in Experiment 1. Kevin's locations consisted of 2 Sterilite® boxes 41.9 x 33 x 16.8 cm. Green construction paper was placed on one of the boxes

and red construction paper was placed on the other box. Also used were two large blue folding travel bags 76 x 38 x 33 cm. The letter A was placed on one of the bags and the letter B was placed on the other bag.

Connor's activities were the same as in Experiment 2. Locations used in teaching were the same as in Experiment 2, with the addition of three boxes covered in white paper and bags with letters (the same bags as for Kevin).

CMEO 4, surprise. For this CMEO, a wooden box with a small padlock, and three fabric boxes measuring 30.5 x 30.5 x 30.5 were used.

Generalization Materials

A novel preferred activity was selected for the generalization assessment. The activity was chosen from the list of activities that the parents identified as preferred, and was an activity that could be done in each CMEO. For Zach and Kevin, this consisted of baking cookies or other goods, and for Connor it consisted of making pudding.

The locations used in generalization for Zach, Kevin, and Connor were the same as in Experiment 2. The exception was that during baseline, teaching, and generalization assessments all four items were present (e.g., both bags, both boxes). For all participants a wrapped box was used during the generalization task. In the natural environment, items, toys, and activities commonly present in the child's daily routines were used.

A video camera was present for most sessions during each phase of the study.

<div align="center">

Research Design

</div>

A modified multiple-baseline design across participants was used to evaluate the teaching package. Baseline assessments across all CMEOs and generalization probes (novel activity/location; natural environment observation) were conducted for Zach and Kevin prior to the commencement of any teaching. The initial baseline for the mand "Which?" was not done with

Connor since he was still learning the mand "Where?" when teaching of the mand "Which?" began with Zach. Teaching then began with Zach. Once Zach met the mastery criterion, generalization probes (novel activity/location; natural environment observation) were administered with him, baseline assessments were repeated with him, and baseline assessments were conducted with Connor for the first time and Kevin for the second time. Teaching then began for the second participant (Kevin). Once Kevin met the mastery criterion, generalization probes (novel activity/location; natural environment observation) were done with Kevin, and baseline assessments were conducted for Connor. Teaching then began with Connor. Once Connor met the mastery criterion, generalization probes (novel activity/location; natural environment observation) were conducted with him.

<div align="center">*Procedure*</div>

Assessments Prior to the Study

Prior to teaching the mand "Which?", a pre-teaching session was conducted to ensure that the participant could go to the correct location. This consisted of having all three pairs of locations (e.g., a red and green box, a bag with A on it, a bag with a B on it, a drawer with a circle, and a drawer with a square) in the room. The participant was told to go and find the item in the designated place (e.g., "Go get what's inside the bag with the A"). If the participant went to the correct location, praise and access to the toy inside was given. If the participant made an error the experimenter re-presented the statement, pointed to the corrected location, and when the participant touched the correct location, non-enthusiastic praise (i.e., good) was given, but access to the toy was not given. Each location was presented 5 times for a total 30 trials. Baselines of the CMEOs and generalization activity only began once the participant was able to go to the correct location 90-100% of the time. Pre-teaching was administered once for Kevin and Connor and twice for Zach.

Baseline Phases Prior to Teaching a Mand

Baselines were administered prior to teaching, and were repeated with participants who had not undergone teaching after a participant who had undergone teaching met the teaching mastery criterion.

Baseline in the natural environment. This was conducted in the same fashion as for the mand "Where?" (Experiment 2) except that opportunities were contrived differently. First, parents contrived opportunities in which their child had the opportunity to mand "Which?", but did not have to mand "Where?". For example a parent could say "Let's play with puppets, go get them, they are in the drawer". Second, parents contrived opportunities in which their child had the opportunity to mand "Where?", and once a vague location was given, their child then had the opportunity to mand "Which?" This was contrived by either saying a script (e.g., "Go get….") or hiding something that their child liked, needed, or wanted (as was done in Experiment 2). For example, suppose that a parent and child sat down to do a craft but the scissors were missing. Suppose that the child manded "Where did it go?" and that the parent said, "The scissors are in a basket." The child then had the opportunity to mand "Which one?" Alternatively the parent could have said "Go get the rackets so we can play tennis", the child mands "Where?", and the parents then say "They're in a drawer", and then the child could mand "Which one?" When contrived in this later way, parents could use one of the five vocal scripts given in Experiment 2.

Parents interacted with their child for one hour or until 10 opportunities to mand had been given (whichever came first). Rules given to the parents were the same as in Experiment 2. When necessary the experimenter would give examples of ways in which the parents could contrive opportunities. During the observation, the experimenter did not participate in any of the activities, and interactions were limited to answering the parents' questions and asking parents to contrive an opportunity in a certain way, at times where only one way had been contrived.

Spontaneous mands were considered correct if they contained the word "Which?" (e.g., "Which one?", "Which one is it?", "Which box?", see Table 10). If the participant missed an opportunity to mand, this was noted as a missed opportunity. A missed opportunity was defined as when a parent asked their child to do/get/find/look/search for, etc. something, and 2 or more options about the item specified by the parent were available, and the child had to ask "Which?" to correctly select the correct item or the child began to actively look in all possible locations for an item (e.g., looking in all boxes) instead of asking "Which?". If the participant found the item he was searching for, this opportunity was not scored. In addition, each time the parent used a different vocal script this was considered a new opportunity. If the parent used one script, the participant asked "Which?" and the same script was used 2 – 3 s later then this was considered a new opportunity. If the same script was used within 10 s but the child had failed to mand in between then this was considered one opportunity (rather than two). The following situations were not scored as successful or missed opportunities; (a) a participant found the hidden item, (b) a participant used the target mand in an inappropriate way, and (c) a sibling used the mand and the participant immediately after repeated what the sibling said. Natural environment observations produced two scores, the percentage of the spoken mand "Which?" without asking "Where?" and the percentage of the spoken mand "Where…… Which?". A score was calculated by dividing the number of spontaneous mands by the number of spontaneous mands and missed opportunities and multiplying by 100%.

Baselines of CMEOs. Prior to the commencement of teaching and after a participant learned the mand "Which?", three baseline trials for each CMEO, were administered, one for each of the three activities chosen for that CMEO. A baseline trial consisted of approaching the participant or beginning the activity (as described later in the description of the CMEOs). A

Table 10.

Samples of the Mand "Which?" that were Considered Correct and Incorrect

Mand	Sample of correct responses	Sample of incorrect responses
Which	Which	Wheh,
	Which one	What, Where, who
	Which one is it	(names the item)
	Which (location) (e.g., Which box)	The (names location)? (e.g.,
		The red box?)

preferred item was hidden during the course of the activity or prior to beginning the activity. A

participant was first required to mand "Where?", and then he was given the name of a vague

location (e.g., "It's in the box", but multiple boxes were present). If the participant correctly

manded "Which?" the answer to his question was given (e.g., "The red box.") and he was

permitted to retrieve the item. If the participant did not mand "Which?" after approximately 10-15

s, or said anything but "Which?" or began opening all containers, then the trial was terminated, the

participant was not told where to find to the item, and an error was scored.

   Baselines of a novel activity and location not used in teaching. A baseline of the

generalization task was taken before teaching began and after a participant met the mastery

criterion in *CMEO 1, hide-and-seek*. A novel activity and location (not one used during the

teaching sessions) were incorporated in the generalization activity. While doing this activity four

trials were conducted. Each trial was contrived similar to one of the four CMEOs. Prompts for

"Which?" were not given and an error correction was not administered. A participant was first

required to ask "Where?" (as illustrated below), and once he asked "Where?" the name of a vague

location was given (e.g., "It's in the drawer" but multiple drawers were present). If the participant

asked "Which?" the answer to his question (e.g., "the drawer with the circle") and access to the

item was given. If the participant failed to mand "Which?" within 10-15 s then the trial was

terminated and the item needed to complete the activity was casually introduced, without calling

attention to it. The following is an example of how the activity of making pudding was

administered. The experimenter approached the participant and gave him a present. The participant

opened the present, however the present was empty (*CMEO 4, surprise*). If the participant asked

"Where?" the experimenter said "It's in the drawer", however multiple drawers were present. If

the participant failed to mand "Where?" after 10-15 s he was then prompted to ask "Where?" If a

participant then manded "Which?" he was told the specific location (e.g., "the drawer with the

circle") and was permitted to retrieve the item. If a participant failed to mand "Which?", the pudding package was casually brought to the counter. The package was opened and emptied into the bowl. Then the experimenter took out a measuring cup and said "We need 2 cups of milk". The milk was poured into the measuring cup, however there was not enough milk to fill up the cup (*CMEO 3, requiring more*). If the participant manded "Where?", he was told "It's in the drawer" (multiple drawers were present). If the participant failed to mand "Where?" after 10-15 s then he was prompted to mand "Where?" If the participant then manded "Which?", he was told the specific location (e.g., "In the drawer with the square") and was permitted to retrieve the item. If the participant failed to mand "Which?", the experimenter casually took the milk and poured it into the bowl. Then the mixer was plugged in, however the beaters were missing (*CMEO 2, missing item*). If the participant manded "Where?" he was told "It's in the drawer" (multiple drawers were present). If the participant failed to mand "Where?," after 10-15 s then he was prompted to ask "Where?" If the participant then manded "Which?" he was told the specific location (e.g., "The drawer with the square") and was permitted to retrieve the item. If the participant failed to mand "Which?" the experimenter casually brought out the beaters and put them on. After the pudding was done, a small portion was put into a bowl for the participant to eat. The participant was asked to get a spoon; while the participant went to get a spoon, the bowls of pudding were hidden (*CMEO 1, hide-and-seek*). When the participant returned with the spoon, if he manded "Where?" he was told "It's in the drawer" (multiple drawers were present). If the participant failed to mand "Where?" after 10-15 s then he was prompted to mand "Where?" If the participant manded "Which?" then he was told the specific location (e.g., "the drawer with the circle") and he could retrieve and eat the pudding. If the participant failed to mand "Which?" the activity was terminated.

Teaching Phase

The teaching procedure consisted of five components: (a) contrived CMEOs, (b) constant prompt delay and prompt fading, (c) natural consequences for correct responding, (d) error correction, and (e) a brief preference assessment.

Contrived CMEOs. The four contrived CMEOs were: (a) *hide-and-seek*, (b) *missing item*, (c) *requiring more*, and (d) *surprise*. Only *CMEO 1, hide-and-seek* was exposed to the teaching package. Four teaching trials were administered in one teaching session; two trials were administered for each activity (unless the participant asked to change activities before the second trial could be administered). Four locations (e.g., two bags and two boxes) were placed near the participant and experimenter. For Connor these four locations were initially tried, but were later changed to three bags and three boxes. The mastery criterion was met when the participant made seven correct independent target mands across two consecutive teaching sessions. Four data sheets were used, one in each session. Since only *CMEO 1, hide-and-seek* was exposed to the teaching procedure, I will describe an example of the teaching procedure with this CMEO. For the other CMEOs, examples of how the baseline and generalization assessments were conducted are given.

CMEO 1. Hide-and-seek. In *CMEO 1,* the experimenter and the participant began by doing an activity. The toy from the activity that the participant played with the most was the toy that was hidden. Once the item was hidden the experimenter waited until the participant manded "Where?" Then the prompting procedures described later commenced. For example, while playing in the water, suppose that water balloons were the items that the participant chose to play with. When the participant was not looking, the experimenter hid the water balloons. After the participant asked "Where balloons?" a vague location was given ("They're in the box"). As the participant moved towards the containers he was prompted to ask "Which one?" (for Zach and Kevin) and "Which box/bag?" for Connor. Once the participant responded to this prompt, the experimenter would say,

"They're in the red box" and the participant was permitted to retrieve the item and continue the activity. For Connor, when the locations changed to white boxes and identical bags, once he appropriately manded "Which box/bag?" I pointed and said "This one".

CMEO 2. Missing item. In *CMEO 2,* an item needed to complete an activity was hidden before presenting the activity and out of sight of the participant. Once the item was hidden, the experimenter and the participant began doing the activity. The following is an example of baseline and generalization assessments of the mand "Which?" with one of the activities. Before doing a writing/drawing activity, the marker was hidden. The participant sat down to write but all that was present was the white board. Once the participant manded "Where?" a vague location was given ("It's in the bag"). Then, if the participant manded "Which?" the experimenter said, "It's in the bag with an A" and the participant was permitted to retrieve the item. If the participant failed to mand "Which?", said anything but "Which?" (e.g., "This one"), or tried to open all the containers, then this response was blocked and scored an error, and the trial was terminated (the activity ended, and the participant did not get access to the hidden item).

CMEO 3. Requiring more. In *CMEO 3,* a small amount of one item needed to complete one of the activities was included with the other materials for that activity. Then the experimenter and the participant began to complete the activity. The following is an example of baseline and generalization assessments of the mand "Which?" with one of the activities. While playing with bubbles (and only a small amount of liquid soap was provided) the participant and experimenter tried to blow bubbles but the bubbles did not inflate. Once the participant manded "Where?", a vague location was given ("It's in the box"). Then, if the participant manded "Which?" the experimenter said, "It's in the green box" and he was permitted to retrieve the item and continue the activity. If the participant failed to mand "Which?", said anything but "Which?" (e.g., "This

one") or tried to open all the containers, then this response was blocked and scored an error, the trial was terminated, and the participant did not get access to the hidden item.

CMEO 4. Surprise. In *CMEO 4*, the mand was contrived in two different ways. The first way consisted of taking an item that the participant had chosen to play with and placing it in a box and then locking the box, while the participant watched. The participant was then given the locked box (but not the key). The second consisted of having three fabric boxes turned upside down in front of the participant. While the participant watched, the item he had chosen was placed under one of the boxes. The participant then was able to retrieve the item. This was repeated a few times. Then the experimenter pretended to place the activity/item under one of the boxes or the item was placed under one the boxes and then the participant was blind folded, and then the item was removed. The participant then attempted to retrieve the item from where he saw the experimenter put it last. Once the participant was unsuccessful in finding the item, and manded "Where?", he was given the vague location of the item. If the participant manded "Which?" he was given the specific location, and permitted to retrieve it. The following is an example of baseline and generalization assessments of the mand "Which?" with one of the activities. Letters that a participant chose to play with were placed in a box, and then the box was locked while the participant watched. The key was hidden out of sight of the participant. Once the participant manded "Where?" a vague location was given ("It's in the bag"). Then, if the participant manded "Which?" the experimenter said, "It's in the bag with the B" and he was permitted to retrieve the item and continue the activity. If the participant failed to mand "Which?", said anything but "Which?" (e.g., "This one") or tried to open all the containers, then this response was blocked and scored an error, and the trial was terminated and the participant did not get access to the hidden item.

Constant prompt delay and prompt fading. This component was the same as described for Experiment 2, except that prompts were for the response "Which?" rather than the response "Where?"

Natural consequences for correct responses. If a participant emitted the correct mand (see Table 10 for a sample of the mands that would be considered correct and incorrect) at the correct time, then the answer to his question was given (e.g., "It's in the red box") and the participant was permitted to retrieve the item and continue the activity. Programmed reinforcers such as tokens and praise were not provided following the occurrences of the mands.

Error correction. This procedure was the same as for Experiment 2.

Preference assessment. This procedure was the same as for Experiment 2.

Discrimination teaching for Zach. Zach was exposed to an additional discrimination teaching procedure, in order to establish appropriate stimulus control over the mands "Where did it go?" and "Which one?" This procedure was identical to the one described above with a few exceptions. First, six trials were presented in one session. On three of those trials Zach had to only ask "Where did it go?", and or the other three trials Zach had to ask "Where did it go…..Which one?" The presentation of the type of trial was randomized. Second, when teaching "Where did it go?" the error correction consisted of blocking access to the locations, and giving him the following explanation "There is only one box/suitcase out, so you only need to ask where", and then prompting "say where did it go". Once he responded to this prompt we would give him the answer to his question. The error correction was repeated until Zach did not ask "Which one?" on trials where he only had to ask "Where did it go?" Third, on trials where Zach only had to ask "Where did it go?", he often said "Which one?" once the answer to the "Where did it go?" question was given, and before the experimenter could respond Zach would often then say, for example, "The green box" (if the green box was the one that was out). Therefore we attempted to

teach Zach to say the specific name of the location once the answer to the question "Where?" was given. Zach often responded to this prompt, however he never said it on his own.

Post-Assessments

Post-assessments occurred once a participant met the mastery criterion for a CMEO and the teaching package.

Generalization to the natural environment. Upon mastery of the mand to *CMEO 1, hide-and-seek* and the teaching package, a participant was observed during approximately 1-hour or 10 opportunities (whichever came first) to mand in the natural environment. This observation was conducted in the same fashion as in the baseline phase. Rules were the same as in baseline. The definition of a successful mand and missed opportunity were the same as in baseline. The scoring method was also the same as in baseline.

Generalization to a novel activity and location. After mastery of the mand with CMEO 1, *hide-and-seek*, generalization of the mand "Which?" to a novel activity, and to a novel location was assessed. While doing this activity four trials were conducted. Each trial was contrived similar to one of the four CMEOs. These were administered the same way as in the baseline phase.

Generalization across CMEOs. The procedure was identical to the baseline of the CMEOs. Three baseline trials one for each CMEO were administered, one for each of the three activities.

Follow-ups. One, two, and four week follow-ups (a five-week follow-up was conducted instead of a four-week follow-up for Connor) were conducted for CMEO 1 (the CMEO exposed to the teaching package). The three activities used in teaching were presented to a participant and he was given the choice of which activity he would like to complete. The follow-up procedure was the same as the baseline procedure for CMEOs except only one trial was administered. In other words no prompting or error correction was provided. If the participant responded correctly then this response was followed by the answer to his question. If the participant failed to mand or did

not respond within 10-15 s then the trial was terminated and he did not get access to the item. See

Table 11, for a summary of the assessments done during each phase.

Reliability and Validity

Inter-observer reliability (IOR). IORs were conducted as described for Experiment 1.

For Zach, IORs were taken for 100% of the pre-teaching sessions, 96% of the CMEO

assessments, 100% of the teaching sessions, 87% of the discrimination teaching sessions, 100% of

the generalization assessments and follow-up, and 50% of the natural environment observations.

Average IORs were 100% for the pre-teaching sessions, 99% (range 83-100%) for CMEO

assessments, 98% (range 88-100%) for teaching sessions, 99% (range 90-100%) of discrimination

teaching sessions, 98% (88-100%) for generalization assessments and follow-up, and 95% (range

90-100%) for the natural environment observations.

For Kevin, IORs were taken for 100% of the pre-teaching sessions, CMEO assessments,

teaching sessions, generalization assessments and follow-up, and natural environment

observations. Average IORs were 100% for the pre-teaching, 99% (range 86-100%) for CMEO

assessments, 100% for teaching sessions, 98% (88-100%) for generalization assessments and

follow-up, and 93% (range 90-100%) for the natural environment observations.

For Connor, IORs were taken for 100% of the pre-teaching sessions, 100% of the CMEO

assessments, 91% of the teaching sessions, 100% of the generalization assessments and follow-up,

and 67% of the natural environment observations. Average IORs were 100% for the pre-teaching

sessions, 97% (range 83-100%) for CMEO assessments, 94% (range 75-100%) for teaching

sessions, 98% (88-100%) for generalization assessments and follow-up, and 100% for the natural

environment observations.

Table 11.

Summary of the Assessments done during Each Phase of Experiment 3

Phase	What needs to be done	Number of trials
Prior to baselines or teaching	Location test	30 (5 trials for each of the 6 locations)
When a participant meets the mastery criterion	Natural environment Observation Generalization to the novel activity and location	10 opportunities or 1 hour 4 (one trial for each CMEO)
	Assessment of the unlearned CMEO	3 trials for each unlearned CMEO
	Follow-up	1 trial for each time period (1-week, 2-week, 4/5-week)
Before beginning teaching	Natural environment observation	10 opportunities or 1 hour
	Generalization to the novel activity and location	4 (one trial for each CMEO)
	Assessment of the unlearned CMEO	3 trials for each unlearned CMEO
	Follow-up	1 trial for each time period (1-week, 2-week, 4-week)

Procedural reliability (PR). PRs were conducted as described for Experiment 1.

For Zach, PRs were taken for 100% of the pre-teaching sessions, 96% of the CMEO assessments, 80% of the teaching sessions, 67% of the discrimination teaching sessions, 100% of the generalization assessments and follow-up, and 50% of the natural environment observations. Average PRs were 100% (range 98-100%) for the pre-teaching sessions, 100% (range 94-100%) for CMEO assessments, 91% (range 83-100%) for teaching sessions, 97% (range 91-100%) of discrimination teaching sessions, 99% (96-100%) for generalization assessments and follow-up, and 100% for the natural environment observations.

For Kevin, PRs were taken for 100% of the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations. Average PRs were 100% for the pre-teaching sessions, 100% for CMEO assessments, 100% for teaching sessions, 99% (96-100%) for generalization assessments and follow-up, and 100% for the natural environment observations.

For Connor, PRs were taken for 100% of the pre-teaching sessions, 82% of the CMEO assessments, 91% of the teaching sessions, 83% of the generalization assessments and follow-up, and 67% of the natural environment observations. Average PRs were 100% for the pre-teaching sessions, 100% for CMEO assessments, 97% (range 92-100%) for teaching sessions, 100% for generalization assessments and follow-up, and 100% for the natural environment observations.

Procedural integrity. PIs were conducted as described in Experiment 1.

For Zach, PIs were taken for 100% of the pre-teaching sessions, 96% of the CMEO assessments, 100% of the teaching sessions, 87% of the discrimination teaching sessions, 100% of the generalization assessments and follow-up, and 50% of the natural environment observations. Average PIs were 98% (range 90-100%) for the pre-teaching sessions, 100% for CMEO

assessments, for teaching sessions, discrimination teaching sessions, generalization assessments and follow-up, and natural environment observations.

For Kevin, PIs were taken for 100% of the pre-teaching sessions, CMEO assessments, teaching sessions, generalization assessments and follow-up, and natural environment observations. Average PIs were 100% for the pre-teaching sessions, CMEO assessments, for teaching sessions, generalization assessments and follow-up, and natural environment observations.

For Connor, PIs were taken for 100% of the pre-teaching sessions, 100% of the CMEO assessments, 92% of the teaching sessions, 100% of the generalization assessments and follow-up, and 67% of the natural environment observations. Average PIs were 100% (range 90-100%) for the pre-teaching sessions, 99% (range 94-100%) for CMEO assessments, 100% for teaching sessions (range 96-100%), 100% for generalization assessments and follow-up, and 100% for natural environment observations. See Appendix H for a sample of the data sheets used.

Social validity. Social validity assessments were conducted as described in Experiment 1.

<u>*Results and Data Analysis*</u>

During the baseline assessments, Zach did not use the mand "Which?" across any of the CMEOs, during the generalization task (novel activity and location; see Figure 9, top panel), or during the natural environment observation (see Figure 10, top panel) prior to teaching. Training began in CMEO 1, and Zach learned in 5 sessions and 20 trials. Following this mastery, a natural environment observation was conducted, and Zach failed to mand across any of the opportunities (see Figure 10, top panel). However, Zach manded 100% (4/4) of the time during the generalization assessment for the novel location and activity. Zach was also now able to use the mand in CMEOs 2, 3, and 4 (see Figure 9, top panel). Zach continued to mand in CMEO 1 up to two weeks following training (a four week follow-up was not administered).
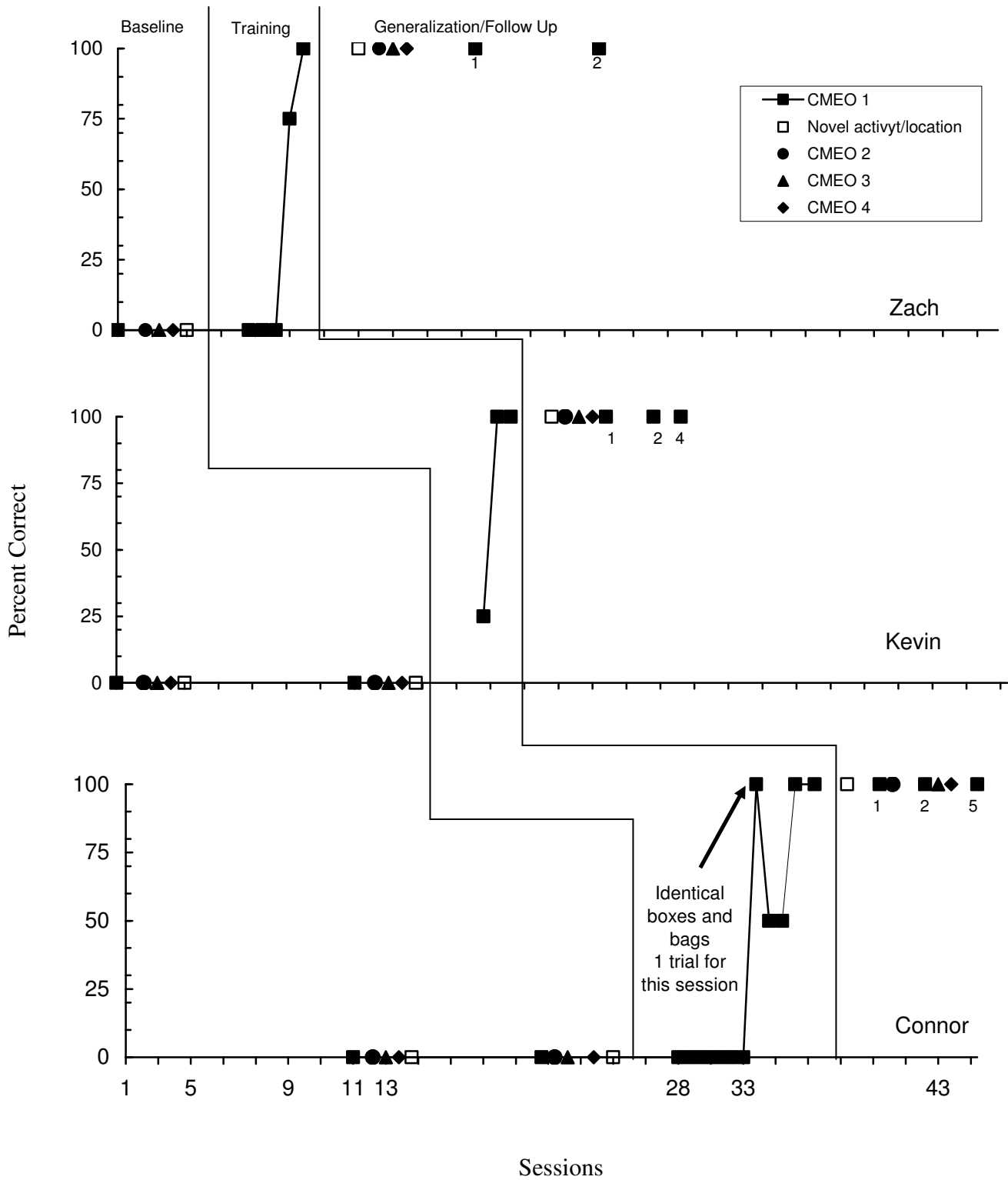
Figure 9. Results across participants for the mand "Which?" The numbers indicate the 1, 2, 4, and 5-week follow-up.
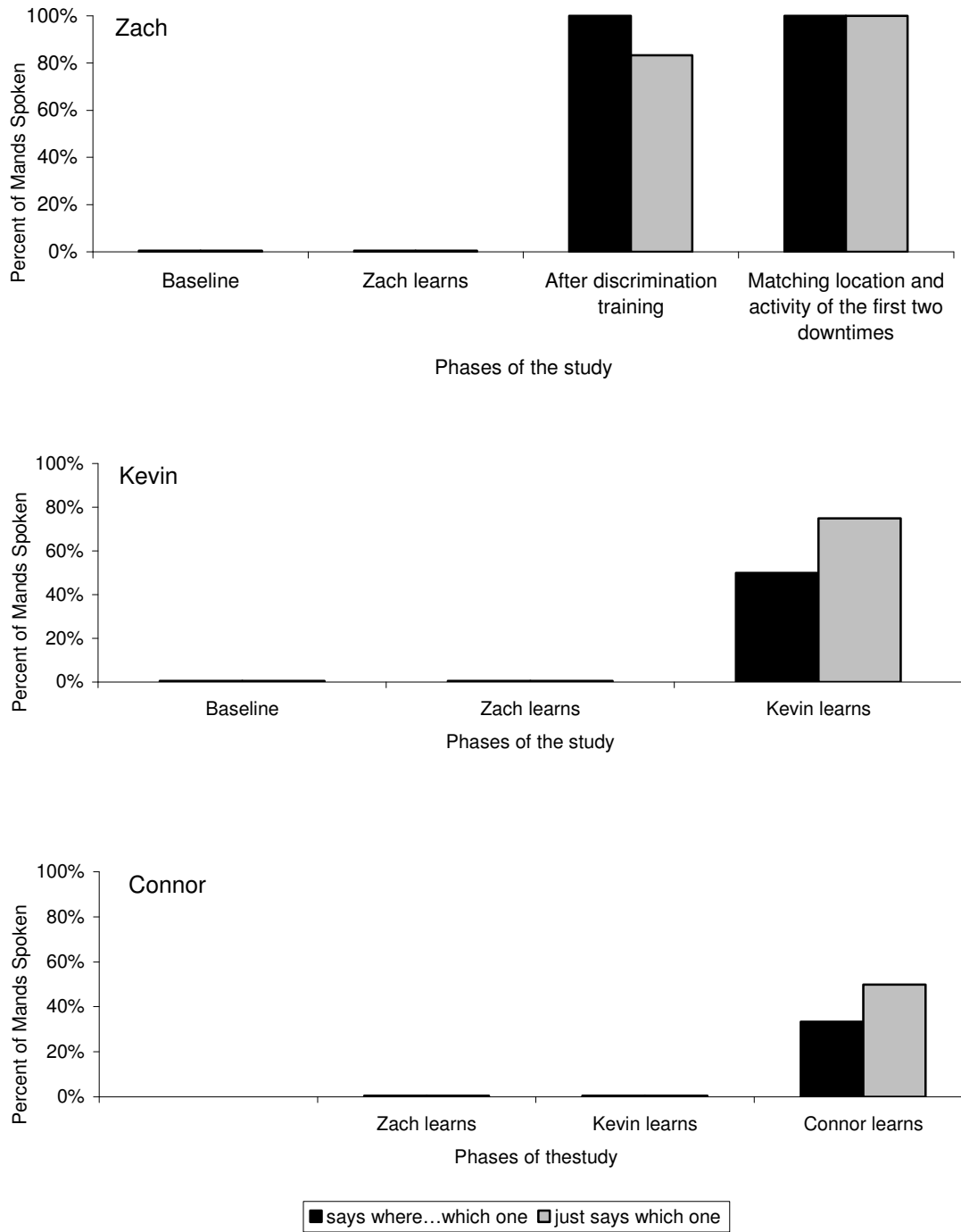
Figure 10. Results of the spontaneous mand "Which?" during the natural environment observation. Black bars indicate that the participant appropriately said "Where?" followed by "Which?", gray bars indicate that the participant appropriately only said "Which?"

Because Zach began to say "Which one?" when it was not appropriate, the discrimination procedure was then introduced. In the discrimination procedure, on some trials Zach was only required to mand "Where did it go?" (only two locations were present, 1 box and 1 suitcase), and on other trials he was required to use the mand "Where did it go?" and when a vague location was given (e.g., "In the suitcase" and two suitcases were present), Zach then was required to mand "Which one?" During baseline assessments Zach performed on average with 50% accuracy (see Figure 11). This was mainly because he manded "Which one?" after manding "Where did it go?" on almost every trial. On discrimination training session 9 (session 21 overall) a new error correction procedure was introduced which consisted of blocking his access to the locations and giving him the following explanation "There is only one box/suitcase out, so you only need to ask where", and then prompting "say where did it go". Once he responded to this appropriately we would give him the answer to his question and he could retrieve the item. The error correction was repeated until Zach did not ask "Which one?" A total of 15 sessions and 90 trials were conducted with this procedure. Zach made some improvements as can be seen in Figure 11. Since Zach's most frequent error was to mand "Which one?" when it was not appropriate, baselines were conducted where he only had to mand "Where did it go?" Three locations were chosen, a piano bench, a cabinet, and a coat. Across each trial of CMEOs 1 to 4, Zach only manded "Where did it go?" and did not mand "Which one?" (see Figure 11). We then decided to assess whether Zach could mand "Which one?" appropriately when novel locations were present. Backpacks and reusable grocery bags were used. On each trial of CMEOs 1 to 4 and on the generalization task (the location for this task did not change, see Figure 11). Zach appropriately manded "Where did it go?" followed by "Which one?" on each of the trials for CMEO 1 to 4 and when presented with the generalization task (novel activity and location). On a few trials, Zach manded "Where did it
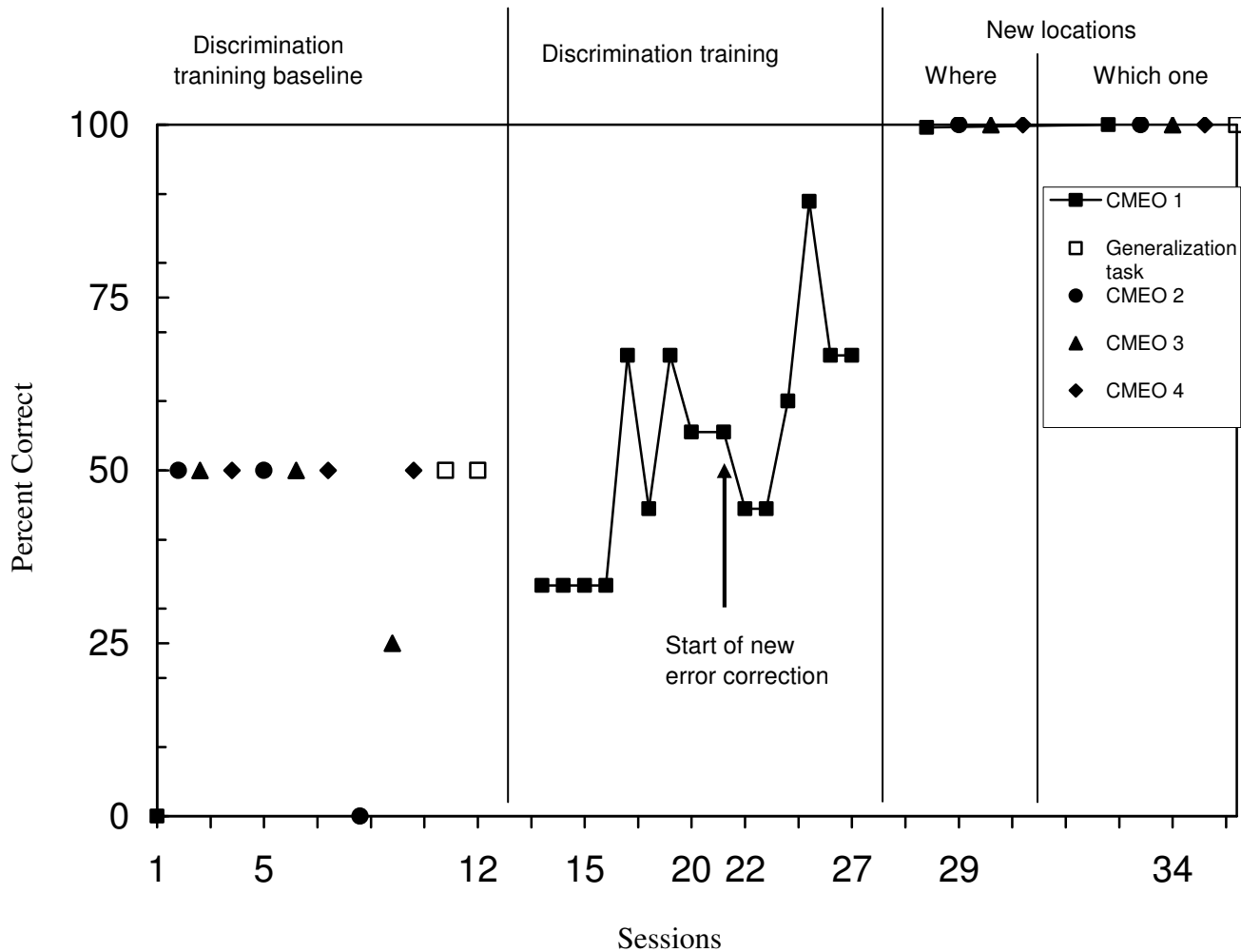
Figure 11. Zach's discrimination teaching results for the mands "Where did it go?" and "Which one?"

go?", and I responded by giving him the name of the location (e.g., "in the backpack"), and he then ran to that location, stopped, manded "Where did it go?" again, and I gave him the same response (e.g., "in the backpack") and after a brief pause he manded "Which one?" I then conducted two natural environment observations. The first one was conducted as usual. Zach's mother interacted with him as she usually did and contrived opportunities for him to mand "Which one" only and "Where did it go…..Which one". Zach manded "Where did it go….Which one" appropriately 100% of the time and just manded "Which one?" without manding "Where did it go?" appropriately 83% of the time (see Figure 10, top panel). In the second natural environment observation I randomly chose ten locations and activities used in the first two natural environment observations (those that Zach was not heard to mand "Which one?"), and tested to see if Zach could now mand "Which one?" appropriately. Zach appropriately manded "Where did it go….Which one?" 100% of the time and "Which one" 100% of the time (see Figure 10, top panel). I also tested whether Zach was able to ask "Where did it go?" appropriately without asking "Which one?" On the first two trials Zach manded "Which one?", however on the last four trials Zach manded "Where did it go?" only appropriately. Then his mother presented an opportunity where he had to mand "Which one?" and Zach was able to mand "Which one?" appropriately. The top panel of Figure 10, shows Zach natural environment results.

During baseline assessments, Kevin did not to use the mand in any of the CMEOs, during the generalization task, or during the natural environment observation. Training then began in CMEO 1, and Kevin mastered "Which one?" in 3 sessions and 12 trials (Figure 9, middle panel). After mastery in training, in the natural environment Kevin manded "Where…Which one?" appropriately 50% of the time, and "Which?" without manded "Where?" appropriately 75% of the time (see Figure 10, middle panel). During this observation I also asked Kevin's mother to present opportunities where Kevin only had to mand "Where?" (asking "Which?" would be

inappropriate), and Kevin appropriately only manded "Where?" each time (5/5). Kevin also

manded "Which?" during the generalization task (4/4) and across CMEOs 2, 3, and 4 (see Figure

9). Up to four weeks following mastery in CMEO 1, Kevin continued to mand appropriately

during these probes.

During baseline assessments, Connor did not use the mand "Which (location)?" across any

of the CMEOs, generalization activity, or during the natural environment observation. Teaching

began in CMEO 1, and during the first six sessions Connor often manded by saying for example

"in the red box…. in the green box….?" when the item was hidden in one of the boxes. We

therefore eliminated all distinctive features from the boxes and bags. In other words the bags no

longer had letters and the boxes were covered in white paper. We also presented three bags and

three boxes. During teaching session 7, only one trial was conducted, since Connor was engaging

in challenging behaviours and therefore the session was terminated. Following the change in

procedure, Connor quickly learned to mand "Which box/bag?" A total of 11 teaching sessions and

41 trials were conducted (see Figure 9, bottom panel). Following mastery, when observed in the

natural environment, Connor appropriately manded "Where.... Which (location)?" 33% of the time

and manded "Which (location)?" without manding "Where?" appropriately 50% of the time (see

Figure 10, bottom panel). During this observation I also asked Connor's mother to present

opportunities where Connor only had to mand "Where?" (manding "Which?" would be

inappropriate), Connor appropriately manded "Where?" (2/2) without manding "Which

(location)?" each time. He was able to mand "Which drawer?" (4/4) 100% of the time during the

generalization task (novel activity and location) and "Which bag/box?" across all trials of CMEOs

2, 3, and 4 (total of 9/9; see Figure 9). One and two week follow-ups were conducted and Connor

correctly manded "Which bag/box?" (see Figure 9). A five-week follow-up was conducted instead

of a four-week because his family was on vacation, and Connor manded "Which (location)?"

Prior to the beginning the study, parents and ABA consultants were asked to rate two questions relating to the importance of teaching WH questions to their child/client and the importance of WH questions as a language or communication skill using a 5-point scale. For all participants, parents and ABA consultants either agreed or strongly agreed with both statements. Upon completion of the study, parents and consultants were asked how much they agreed with six statements relating to the goal of teaching "Which?", the satisfaction of the training procedure and results. On average Zach's mother's score averaged 4.3 and his consultant's score averaged 4, Kevin's mother's score averaged 4.8 and his consultant's score averaged 4, and Connor's mother's and consultant's score both averaged 4.5. Therefore overall parents and consultants were satisfied (see Table 12).

Discussion

All the participants learned the mand "Which?" Overall, generalization occurred for each of the participants to the natural environment, a novel activity and location, and over time.

Several differences in performance were noted between the participants. First, as mentioned previously Zach had difficulty learning when to say "Which one?" and when not to say "Which one". Both Connor and Kevin were observed to engage in a common chain of behaviours (i.e., asking "Where?", going to the locations, scanning the locations, and then asking "Which?"), which may be a reason why generalization to the natural environment occurred for both of them and not initially for Zach. Second, Connor learned "Which?" best when the locations used were identical (identical bags and identical boxes). Connor had a history of using the labels of items when manding and speaking. Therefore when told, "it's in the bag," for example, and there being different types of bags, that increased the likelihood that Connor would use a label in his mand "in the bag with the A….?" Once the stimulus change was introduced immediate increases in

Table 12.

Results of Social Validity Questionnaire on a Scale of 1 (strongly disagree) to 5 (strongly agree) for the

Mand "Which?"

Questions	Zach		Kevin		Connor	
	Parent	Consultant	Parent	Consultant	Parent	Consultant
1. I thought the goal of teaching my child/client to request information using "Where is it?" (or variations of) was an important goal for him/her.	5	4	5	4	5	5
2. I found the training procedure to be acceptable	4	4	5	4	5	5
3. I was satisfied with the efforts made to teach my child/client to request information by asking "Where is it?" (or variations of).	4	5	5	5	5	5
4. I have observed my child/client requesting information by asking "Where is it?" (or variations of) appropriately and more frequently.	4	3	4	3	2	2
5. I would be willing to use this teaching procedure again to teach my child/client other skills (e.g., other WH questions).	4	4	5	4	5	5
6. I think that the ability to request information by asking "Where is it?" is an important language and communication skill.	5	4	5	4	5	5

appropriately manding "Which?" occurred. Lastly, Kevin performed better than Zach and Connor. He met the mastery criterion in fewer trials and generalization to the natural environment (between 50-75% of opportunities) occurred. When comparing the participants age-equivalences on the PLS-4, Kevin scores were 11 months higher than Zach's and 16 months higher than Connor's. Kevin was also learning to speak both French and English. This suggests that Kevin had stronger language skills than the other two participants.

Similarities across participants were also noted. First, Kevin and Connor manded more often in the natural environment when they only had to say "Which?" versus when they had to say "Where….Which?" this finding is interesting in that only having to say "Which?" differs from the way that the opportunities were contrived during the teaching phase. It is possible that only manding "Which?" requires less effort and that access to the reinforcer is much faster than when saying "Where….Which?" Second, for all participants generalization to the novel activity and location, to novel CMEOs, and across time occurred.

None of the studies reviewed to date have examined teaching the mand "Which?" Further none of the studies examined teaching the chain "Where….Which?" However the training procedure in this study and other studies were similar (e.g., see Betz et al., 2010; Endicott & Higbee, 2007; Lechago et al., 2010; Roy-Wsiaki et al., in press; Sundberg et al., 2002). In this study, generalization to other CMEOs occurred after only training in one CMEO, whereas in the Roy-Wsiaki et al., study numerous CMEOs had to occur before generalization to a novel CMEO emerged. Limitations and areas of future research will be discussed in the Overall Summary.

OVERALL SUMMARY

In Experiment 1, three children with autism were taught to mand for information by using the mand "What is it?", and generalization to a novel activity and script/location, to the natural environment, and over time occurred. Two participants, Zach and Kevin only required teaching in two CMEOs before generalization to novel CMEOs emerged. Luke required teaching in three CMEOs before generalization to a novel CMEO occurred. In the natural environment participants were observed to mand during more opportunities when vocal scripts were not provided versus when vocal scripts were provided. Two reasons may explain this finding. First, opportunities without vocal scripts more closely resembled the way in which the CMEOs were contrived during the teaching phase. Second, it is possible that the vocal scripts did not create a strong enough CMEO, as Zach for example often did not acknowledge what his mother had said, he just kept playing.

In Experiment 2, three children with autism were taught to mand for information by using the mand "Where?", and generalization to a novel activity, location, CMEOs, to the natural environment and across time occurred. Connor required teaching in two CMEOs before generalization to the natural environment occurred. As in Experiment 1, Chris and Connor performed better in the natural environment when vocal scripts were not provided versus when vocal scripts were provided. Again the former opportunities more closely resembled those in the teaching phase, which may have produced better generalization. Chris's performance was better than both Zach's and Connor's and the reason for this may have been that Chris had fewer language delays when compared to typical children. Zach began using the mand "What is it?" rather than "Where is it?" due to corrections given to him in the natural environment. This may have also reduced the speed at which he learned the teaching task.

In Experiment 3, three children with autism were taught to mand for information by using the mand "Which?" and generalization to a novel activity, location, CMEOs, the natural environment, and across time was observed for all participants. Kevin and Connor were observed to use the mand "Which?" in the natural environment after meeting the mastery criterion in CMEO 1, whereas Zach required additional teaching before he was able to do so. Kevin and Connor performed better when they were only required to say "Which?" rather than "Where….Which?" Possible reasons for this finding are that only needing to ask "Which?" is less effortful and results in faster acquisition of the reinforcer.

Across the three Experiments the teaching procedure was effective in teaching children with autism to mand for information using the mands, "What is it?," "Where?," and "Which?" Several limitations and areas for future research should be noted. First, only three participants were used in each Experiment, and they met very specific inclusion criteria. Therefore external validity is limited. Future research should replicate the present study with more participants. In Experiment 1, there is a potential violation of construct validity, however I believe that since generalization of the mand "What is it?" occurred, and various forms of the mand "What is it?" (e.g., "What happened?") emerged, and were maintained in the absence of receiving a tangible reinforcer, construct validity was not violated. Future studies might also examine whether teaching a different CMEO first would produce the same type of generalization. Also future studies might examine whether teaching both vocal and non-vocal scripts would produce stronger generalization to the natural environment. Future studies might also examine whether teaching using a textual or vocal prompt is more effective and whether teaching a discrimination procedure first would produce stronger generalization to the natural environment than the original teaching procedure in this study. Lastly future studies might examine teaching other variations of the mand "What?", such as "What happened?" or "What are you doing?"

The present research expanded in several ways on previous research on teaching mands to children with autism. First, I taught children with autism to mand while engaging in an activity with another person (e.g., playing with cars or doing a craft), and only one previous study had examined this, (Roy-Wsiaki et al., in press). Second, I examined whether the same topographically similar mand would generalize when different CMEOs were presented (e.g., preferred toy hidden during play, missing an item to a preferred activity). This procedure differed from Lechago et al. (2010) since they investigated whether the mands "Where?" and "Who" would generalize to novel activities, but the way in which the CMEO was contrived was the same. Third, a limitation of the Sundberg et al. (2002) study was that they may have taught intraverbals rather than mands (Betz et al., 2010) since vocal scripts were used, and Betz et al., identified that using vocal scripts during teaching the mand "Where?" did not produce generalization to the natural environment. Generalization occurred when vocal scripts were not provided. The present Experiments demonstrated that using various non-vocal scripts for the mands "What?" during teaching as well as assessing generalization to a novel script (for the mand "What?"), and not using any vocal script for the mands "Where?" and "Which?" (similar to Lechago et al.) produced generalization to the natural environment, novel CMEOs, activities, and over time suggesting that a CMEO was truly contrived. Fourth, Experiment 1 demonstrated that teaching the mand "What?" was effective when modifications to the scripts used in the Roy-Wsiaki et al. were used. Fifth, Experiment 2 demonstrated that once the participants were taught to mand "Where?" without vocal scripts, generalization occurred to the natural environment with and without vocal scripts. Sixth, Experiment 3 demonstrated that the mand "Which?" could be taught. No study to date has examined teaching "Which?" or "Where….Which?" Finally the present experiments objectively demonstrated generalization to the natural environment, a novel activity, a novel script, a novel location, and across time. Only Roy-Wsiaki et al. examined all those elements of generalization.

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Appendix A

PARENT QUESTIONAIRE FORM

BACKGROUND INFORMATION (please print)

CHILD'S NAME: _____ _____   **DOB** _____

PARENTS' NAME _____ _____ ____   **GENDER** _____

DIAGNOSIS: _____

THINGS YOUR CHILD LIKES

Describe some of your child's favourite activities
(e.g., watching movies, swimming, colouring, ridding his/her bike).

_____

_____

_____

Describe some of your child's favourite foods (e.g., coke, smarties, bacon, french fries). Also indicate any allergies.

_____

_____

_____

Describe some of your child's favourite toys (e.g, cars, dolls, trains, blocks, balls)

_____

_____

_____

 Describe any toys, activities, foods, that your child refuses or dislikes.

_____

_____

_____

CLIENT QUESTIONAIRE FORM (CON'T)

Please indicate which of the following activities and toys your child enjoys or that you think he/she would enjoy.
**** Please note that items that you check off here were considered as items used in the study. Therefore the items you check off, should be ones that you are prepared to withhold from your child outside of the teaching sessions.

Hide-and-seek	Missing Item	Requiring More
€ Cars	€ Play doh*	€ Making juice*
€ Dolls	€ Mr Potato Head	€ Making a volcano*
€ Trains	€ Crafts*	€ Making goo*
€ Blocks	€ Playing board games:	€ Face Painting
€ Shape sorter	_____	€ Playing with bubbles*
€ Little people sets	_____	€ Baking Cookies*
€ Farm animals	_____	€ Painting*
€ Playing in sand	€ Puzzles	€ Decorating cupcakes*
€ Water play	€ Decorating clothes (gloves, shoes, T-shirt)*	€ Making pizza*
€ Playing with tools	€ Decorating balloons*	€ Making chocolate milk*
€ Draw	€ Colouring	€ _____
€ _____	€ Fishing	€ _____
€ _____	€ Bowling	€ _____
€ _____	€ Alphabet magnets	€ _____
€ _____	€ Books on tape	€ _____
€ _____	€ Pretend cooking	€ _____
€ _____	€ Golf	€ _____
	€ Making jewellery	
	€ _____	

CLIENT QUESTIONAIRE FORM (CON'T)

ASSESSMENT SCORES

If your child has had any standardized assessments taken please complete the following section

Preschool Language Scale (PLS-4)
Date of Administration _____
1.Age equivalence on auditory comprehension: _____
2. Age equivalence on expressive comprehension: _____

Clinical Evaluation for Language (CELF)
Date of Administration _____
Results:_____

SKILL INFORMATION

How does your child communicate his or her needs and wants:
Speaking _____   ASL _____   Pictures _____

Talking device _____   Writing _____   Other (specify) _____

How many words/sign/other does your child use to communicate (e.g., I want cookie would be considered 3 words)? _____

Does your child request:

Items that are: (note you can circle both)	**Present**	**Not Present**
Things that he/she wants?	**YES**	**NO**
Using who (e.g., Who is coming over?)?	**YES**	**NO**
Using what (e.g., What is that?)?	**YES**	**NO**
Using where (e.g., "Where is my __?)?	**YES**	**NO**
Using when (e.g., "When are we going to grandmas?)?	**YES**	**NO**
Using which (e.g., "Which one do you want?)?	**YES**	**NO**

Appendix B

CONSULTANT LANGUAGE QUESTIONNAIRE

Participant _____
Date _____
Consultant _____

TACTS

1. How many <u>objects</u> can the above-mentioned participant name? (circle)

(10- 15)   (16-25)   (26-35)   (35- 50)   (50 – 75)   (75 – 100)   More than 100 objects

If you know exact number please write here: _____

2. How many <u>pictures</u> can the above-mentioned participant name? (circle)

10- 15)   (16-25)   (26-35)   (35- 50)   (50 – 75)   (75 – 100)   More than 100 pictures

If you know exact number please write here: _____

INTRAVERBALS

Can the above-mentioned participant:

Answer questions regarding function of items?   Yes   or   No

Answer questions regarding feature of items?   Yes   or   No

Answer questions regarding class of items?   Yes   or   No

Answer personal questions (if yes how many)   Yes   or   No

Other _____
        _____
            _____

GENERAL LANGUAGE

On average how many words does the above-motioned participant use when making appropriate requests
_____

On average how many words does the above-motioned participant use when use when talking functionally (e.g., labeling, making a statement).

Appendix C

PARENT/CONSULTANT PRE-STUDY SOCIAL VALIDITY QUESTIONNAIRE

Participant: _____

Date:_____

Parent/Consultant: _____

Please refer to the scale and circle the number that best describes your response to the following statements:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1. I think the goal of teaching my child/client to request using "WH" questions is an important goal for my child/client.

    1   2   3   4   5

2. I think that the ability to request using "WH" questions is an important language and communication skill.

    1   2   3   4   5

CONSULTANT/PARENT SOCIAL POST-TEACHING SOCIAL VALIDITY QUESTIONNAIRE

WHAT IS IT?

Client : _____

Date:_____

Parent/Consultant: _____

Please refer to the scale and circle the number that best describes your response to the following statements:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. I thought the goal of teaching my child/client (name above) to request information using "What is it?" was an important goal for him.

    1   2   3   4   5

8. I found the teaching procedure to be acceptable

    1   2   3   4   5

9. I was satisfied with the efforts made to teach my child/client (name above) to request information by saying "What is it?".

    1   2   3   4   5

10. I have observed my child/client requesting information by saying "What is it?" appropriately and more frequently.

    1   2   3   4   5

11. I would be willing to use this teaching procedure again to teach my child/client (name above) other skills (e.g., other WH questions).

    1   2   3   4   5

12. I think that the ability to request information by asking "What is it?" is an important language and communication skill.

    1   2   3   4   5

CONSULTANT/PARENT SOCIAL POST-TEACHING SOCIAL VALIDITY QUESTIONNAIRE

WHERE?

Client : _____

Date:_____

Parent/Consultant: _____

Please refer to the scale and circle the number that best describes your response to the following statements:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. I thought the goal of teaching my child/client (name above) to request information using "Where?" (or variations of) was an important goal for him.

          1   2   3   4   5

14. I found the teaching procedure to be acceptable

          1   2   3   4   5

15. I was satisfied with the efforts made to teach my child/client (name above) to request information by saying "Where?" (or variations of).

          1   2   3   4   5

16. I have observed my child/client requesting information by saying "Where is it? (or variations of)" appropriately and more frequently.

          1   2   3   4   5

17. I would be willing to use this teaching procedure again to teach my child/client (name above) other skills (e.g., other WH questions).

          1   2   3   4   5

18. I think that the ability to request information by asking "Where is it?" (or variations of) is an important language and communication skill.

          1   2   3   4   5

CONSULTANT/PARENT SOCIAL POST-TEACHING SOCIAL VALIDITY QUESTIONNAIRE

WHICH?

Client : _____

Date:_____

Parent/Consultant: _____

Please refer to the scale and circle the number that best describes your response to the following statements:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1. I thought the goal of teaching my child/client (name above) to request information using "Which?" (or variations of) was an important goal for him.

        1   2   3   4   5

2. I found the teaching procedure to be acceptable

        1   2   3   4   5

3. I was satisfied with the efforts made to teach my child/client (name above) to request information by saying "Which?" (or variations of).

        1   2   3   4   5

4. I have observed my child/client requesting information by saying "Which?" (or variations of) appropriately and more frequently.

        1   2   3   4   5

5. I would be willing to use this teaching procedure again to teach my child/client (name above) other skills (e.g., other WH questions).

        1   2   3   4   5

6. I think that the ability to request information by asking "Which?" (or variations of) is an important language and communication skill.

        1   2   3   4   5

Appendix D

WHAT IS IT?

CMEO 1. HIDE-AND-SEEK

Set up	Script	Experimenter	Child	Experimenter
The participant and experimenter began by playing a preferred activity. Out of view from the participant the experimenter would then hide a preferred toy.	A	Laughing to self (hiding stimuli in coat)	**WHAT**	(name item)
	B	Dododo (looking suspicious)	**WHAT**	(name item)
	C	Whistling (looking suspicious)	**WHAT**	(name item)

CMEO 2. MISSING ITEM

Set up	Script	Experimenter	Child	Experimenter
Prior to beginning the activity and out of view of the participant an item needed to complete the activity was hidden. Then the participant and experimenter began to play the activity.	A	Uh oh (looking around)	**WHAT**	(name item)
	B	Pat floor, look around	**WHAT**	(name item)
	C	Gasp and cover mouth	**WHAT**	(name item)

CMEO 3. REQUIRING MORE

Set up	Script	Experimenter	Child	Experimenter
All the items needed for an activity was present, however there was not enough of an item for the activity to be completed.	A	Oh no! (hands out palms up)	**WHAT**	(name item)
	B	Hmmm (tap chin)	**WHAT**	(name item)
	C	Sigh	**WHAT**	(name item)

CMEO 4. SURPRISE

Set up	Script	Experimenter	Child	Experimenter
While the participant is playing with an activity the experimenter approached him/her and started the script	A.	Takes it out of bag, hide behind back	**WHAT**	(name item)
	B.	Peek around a door. "Ooooh"	**WHAT**	(name item)
	C.	Shake a present	**WHAT**	(name item)

Scripts A and B were used during teaching sessions
Script C were used to assess for generalization

WHERE?

CMEO 1. HIDE-AND-SEEK

Set up	Phase	Experimenter	Child	Experimenter
The participant and experimenter began by playing a preferred activity. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching	Hides a preferred toy	**WHERE**	(name location where item was found)
	Generalization	Hides preferred item	**WHERE**	(name location where item was found)

CMEO 2. MISSING ITEM

Set up	Phase	Experimenter	Child	Experimenter
Prior to beginning the activity and out of view of the participant an item needed to complete the activity was hidden. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching	Presents activity with a missing item to the participant	**WHERE**	(name location where item was found)
	Generalization	Presents a trial with something missing	**WHERE**	(name location where item was found)

CMEO 3. REQUIRING MORE

Set up	Phase	Experimenter	Child	Experimenter
All the items needed for an activity was present, however there was not enough of an item for the activity to be completed. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching	Presents an activity with not enough of an item for the activity to be completed	**WHERE**	(name location where item was found)
	Generalization	Presents trial where more of something is needed	**WHERE**	(name location where item was found)

CMEO 4. SURPRISE

Set up	Phase	Experimenter	Child	Experimenter
While the participant is near the experimenter. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching 1.	Experimenter placed a chosen item in a locked box, gives the participant the box and hides the key, out of the participant's sight	**WHERE**	(name location where item was found)
	Teaching 2.	The experimenter places a chosen item under one box, the participant retrieves that item. This is repeated. The experimenter pretends to place a chosen item under a box	**WHERE**	(name location where item was found)
	Generalization	Gives an empty present to the participant	**WHERE**	(name location where item was found)

WHICH?
CMEO 1. HIDE-AND-SEEK

Set up	Phase	Experimenter	Child	Experimenter	Child	Experimenter
The participant and experimenter began by playing a preferred activity. Four containers are close by (e.g., 2 boxes and 2 bags) during teaching. Two drawer were close by in generalization	Teaching	Hides a preferred toy	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location
	Generalization	Hides preferred item	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location

CMEO 2. MISSING ITEM

Set up	Phase	Experimenter	Child	Experimenter	Child	Experimenter
Prior to beginning the activity and out of view of the participant an item needed to complete the activity was hidden. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching	Presents activity with a missing item to the participant	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location
	Generalization	Presents a trial with something missing	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location

CMEO 3. REQUIRING MORE

Set up	Phase	Experimenter	Child	Experimenter	Child	Experimenter
All the items needed for an activity was present, however there was not enough of an item for the activity to be completed. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching	Presents an activity with not enough of an item for the activity to be completed	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location
	Generalization	Presents trial where more of something is needed	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location

CMEO 4. SURPRISE

Set up	Phase	Experimenter	Child	Experimenter	Child	Experimenter
While the participant is near the experimenter. Two containers are close by (e.g., box and bag) during teaching. A drawer was close by in generalization	Teaching 1.	Experimenter placed a chosen item in a locked box, gives the participant the box and hides the key, out of the participant's sight	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location
	Teaching 2.	The experimenter places a chosen item under one box, the participant retrieves that item. This is repeated. The experimenter pretends to place a chosen item under a box	**WHERE**	(name vague location where item was found)	**WHICH**	Name specific location
	Generalization	Gives an empty present to the participant	**WHERE**	(name vague location where) item was found)	WHICH	Name specific location

Appendix E.
ECHOIC PRE-TEACHING DATASHEET

Participant _____   Trainer _____
Date _____   IOR/PR _____
Score _____

WORDS "Say ____"	INTEROBSERVER RELIABILTY		PROCEDURAL RELIBILITY	
	INDEPENDENT RESPONSE	ERROR	Correct S^D	Correct Consequence
Who				
What				
Who				
Which one				
What				
Who				
Where				
Where				
Which one				
Which one				
Who				
Where				
Where				
What				
Which one				
Who				
Where				
Which one				
What				
What				

GENERALIZATION TO NATURAL ENVIRONEMENT –DATASHEET – WHAT IS IT?

Trainer _____   IOR/PR_____

Participant _____

Date _____   Score [(spontaneous/spont+missed)*100] _____

PHASE OF THE STUDY (circle)   BEFORE STARTING STUDY   AFTER MASTERY OF CMEO_____

INTEROBSERVER RELIABILTY				PROCEDURAL RELIBILITY		
Spontaneous mand made		Missed opportunity		Experimenter gave rules to parent before starting	Y	N
With a **vocal script**	With a **non-vocal script**	With a **vocal script**	With **a non-vocal script**	Experimenter did not interact with parents or child	Y	N

RULES

1. Interact with your child until we say stop
E.g., Play, teach a skill (e.g., how to share, play, cook, art and craft), engage in regular routines

2. Do not prompt your child to use the target WH request

3. Contrive opportunities for your child to request using the target request
=> use one of the vocal and non-vocal scripts provided at least once

4. Do not use any of the activities that are being used or will be used in the study.

5. Avoid doing solitary activities (e.g., watching a movie, playing on the computer)

6. Other family members can be present (e.g., siblings, other parent)

7. If your child does not respond within 10-15 second provide them with what would have been the answer

MISSED OPPORTUNITY
Missed Opportunities were defined as when a parent makes a statement using a pronoun (e.g., it, something) so that a request by the participant for more information by asking "What?", would be appropriate and the participant fails to mand appropriately to get more information regarding the pronoun given, or when the parent makes a sound or body gesture regarding an item or CMEO with a missing, needed, or wanted component (e.g., say "oh" when they cannot find a missing puzzle piece)

BASELINE DATA SHEETS CMEO 1 -HIDE-AND-SEEK –WHAT IS IT?

PARTICIPANT _____

Date (MM/DD/Y) _____

Trainer _____

Baseline word _____

IOR/PR Person _____

| I = Ind (no prompt) |
| E = Error (wrong response or NR on step 4) |

SCRIPT: B Activity _____	**Item hidden**	**Dodododo (look suspicious)**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
SCRIPT: A Activity _____	**Item hidden**	**Laughing to self (holding item in coat)**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
SCRIPT: A Activity _____	**Item hidden**	**Laughing to self (holding item in coat)**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

BASELINE DATA SHEETS CMEO 2 –MISSING ITEM –WHAT IS IT?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

Baseline word _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	(pat floor and look around)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
SCRIPT: A Activity _____	Item hidden	Uh oh (looking around)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
SCRIPT: A Activity _____	Item hidden	Uh oh (looking around)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

BASELINE DATA SHEETS CMEO 3 –REQUIRING MORE –WHAT IS IT?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

SCRIPT: B Activity _____	Item hidden	Hmm (tap chin)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up)	What	(name item)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

BASELINE DATA SHEETS CMEO 4 –SURPRISE –WHAT IS IT?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	(peek around door) Ooooh!	What	(name item)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
SCRIPT: A Activity _____	Item hidden	(takes item out of bag, hide behind back)	What	(name item)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
SCRIPT: A Activity _____	Item hidden	(takes item out of bag, hide behind back)	What	(name item)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

TEACHING DATA SHEETS CMEO 1- HIDE-AND-SEEK- (1) WHAT

PATICIPANT _____

Date (MM/DD/Y) _____

Trainer _____

IOR/PR _____

| I = Ind (no prompt) |
| FP = Full Prompt (gave all answer) |
| PP = Partial Prompt (gave part of answer) |
| E = Error (wrong response or NR on step 4) |

SCRIPT: B Activity _____	Item hidden	Dodododo (look suspicious)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step __ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	Item hidden	Laughing to self (holding item in coat)	What	(name item).
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	Item hidden	Laughing to self (holding item in coat)	What	(name item).
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed ☐
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: B Activity _____	Item hidden	Dodododo (look suspicious)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐

TEACHING DATA SHEETS CMEO 2- MISSING ITEM- (1) WHAT

PARTICIPANT _____   Trainer _____
Date (MM/DD/Y) _____   IOR/PR _____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response or NR on step 4)

SCRIPT: B Activity _____	**Item hidden**	**(pat floor and look around)**	**What**	**I CAN'T FIND (name)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step __ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	**Item hidden**	**Uh oh (looking around)**	**What**	**WE ARE MISSING (name)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	**Item hidden**	**Uh oh (looking around)**	**What**	**WE ARE MISSING (name)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐
SCRIPT: B Activity _____	**Item hidden**	**(pat floor and look around)**	**What**	**I CAN'T FIND (name)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐

TEACHING DATA SHEETS CMEO 3- REQUIRING MORE- (1) WHAT

PARTICIPANT_____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR _____

SCRIPT: B Activity _____	Item hidden	Hmm (tap chin)	What	LET'S ADD SOME (NAME)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step __ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	Error: Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up)	What	WE/IT NEEDS MORE (NAME)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	Error: Repeat statement ☐ Prompt ☐
SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up)	What	WE/IT NEEDS MORE (NAME)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed Script ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	Error: Repeat statement ☐ Prompt ☐
SCRIPT: B Activity _____	Item hidden	Hmm (tap chin)	What	LET'S ADD SOME (NAME)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step ___ Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	Error: Repeat statement ☐ Prompt ☐

DATASHEET – GENERALIZATION- NOVEL ACTIVITY AND SCRIPT – WHAT IS IT?

PARTICIPANT _____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NO RESPONSE - NR)

SCRIPT: C CMEO 4	Item hidden	(Shake a present)	What	(Name item
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

SCRIPT: C CMEO 3	Item hidden	Sigh	What	(Name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

SCRIPT: C CMEO 2	Item hidden	Gasp (cover mouth)	What	(Name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

SCRIPT: C CMEO 1	Item hidden	Whistling (looking around)	What	(Name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle) BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

FOLLOW-UP DATASHEET- CMEO 1. HIDE-AND-SEEK –WHAT IS IT?

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

SCRIPT: A Activity _____	Item hidden	Laughing to self (holding item in coat)	What	(name item).
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	Dodododo (look suspicious)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	Dodododo (look suspicious)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOLLOW-UP DATASHEET- CMEO 2. MISSING ITEM –WHAT IS IT?

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

> I = Ind (no prompt)
> E = Error (wrong response or NR on step 4)

SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up))	What	WE ARE MISSING (NAME)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	(pat floor and look around)	What	I CAN'T FIND (NAME)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	(pat floor and look around)	What	I CAN'T FIND (NAME)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOLLOW-UP DATASHEET- CMEO 3. REQUIRING MORE –WHAT IS IT?

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

SCRIPT: A Activity _____	Item hidden	Oh no! (hands out, palms up)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	Hmm (tap chin)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B Activity _____	Item hidden	Hmm (tap chin)	What	(name item)
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOLLOW-UP DATASHEET- CMEO 4. SURPRISE –WHAT IS IT?

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

SCRIPT: A **Activity** _____	**Item hidden**	**(takes item out of bag, hide behind back)**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____ IOR/PR Person _____

SCRIPT: B **Activity** _____	**Item hidden**	**(peek around door)** **Ooooh!**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

SCRIPT: B **Activity** _____	**Item hidden**	**(peek around door)** **Ooooh!**	**What**	**(name item)**
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

Appendix F

Textual Prompt
STEP 1

WHERE

Textual Prompt
STEP 2

WHERE

Textual Prompt
STEP 3

WHERE

Textual Prompt
STEP 4

WHERE

Textual Prompt
STEP 5

WHERE

Appendix G.

LOCATION PRE-TEACHING DATASHEET -WHERE

Participant _____   Trainer _____
Date _____   IOR/PR _____
Score _____

Location 1: _____   Location 2: _____   Location 3 : _____

Location "Go get what is inside the ____"	INTEROBSERVER RELIABILTY		PROCEDURAL RELIBILITY	
	INDEPENDENT RESPONSE	ERROR	Correct S^D	Correct Consequence
3.				
1.				
1.				
3.				
1.				
2.				
3.				
1.				
2.				
2.				
2.				
3.				
2.				
1.				
3.				

GENERALIZATION TO NATURAL ENVIRONEMENT –DATASHEET – WHERE?

Trainer _____   IOR/PR _____

Child _____

Date _____   script used by the parent _____

Mand _____

Score [(spontaneous/spont+missed)*100] _____

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

INTEROBSERVER RELIABILTY				PROCEDURAL RELIBILITY		
Spontaneous mand made		Missed opportunity		Experimenter gave rules to parent before starting	Y	N
With a statement	Without a statement	With a statement	Without a statement	Experimenter did not interact with parents or child	Y	N

```
                        RULES
1. Interact with your child for the entire hour
      E.g., Play
            Teach a skill (e.g., how to share,
              play, cook, art and craft)

2. Do not prompt your child to use the target WH
request

3. Contrive opportunities for your child to request
using the target request
    => use on the scripts provided at least once

4. Do not use any of the activities that are being
used or will be used in the study.

5. Avoid doing solitary activities (e.g., watching a
movie, playing on the computer)

6. Other family members can be present (e.g.,
siblings, other parent)
```

MISSED OPPORTUNITY - WHERE

A missed opportunity was defined as when the participant unsuccessfully searched for an item that was needed and a request for more information by asking "Where?" would be appropriate and the participant failed to mand appropriately to get more information OR When the parent asked the child to get/find/look etc for something and upon unsuccessful searching the parent must give the child additional information in order for the child to find the item.

BASELINE DATA SHEETS CMEO 1 -HIDE-AND-SEEK –WHERE?

PARTICIPANT_____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

 Baseline word _____

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(a)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2(a)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(b)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT
___

BASELINE DATA SHEETS CMEO 2 –MISSING ITEM –WHERE?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1a
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2a
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1b
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

BASELINE DATA SHEETS CMEO 3 –REQUIRING MORE –WHERE?

PARTICIPANT _____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

Baseline word _____

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(a)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2(a)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(b)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Env _____				**Error:** Trial terminated	☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT
___

BASELINE DATA SHEETS CMEO 4 -SURPRISE –WHERE?

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

PARTICIPANT _____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR _____

Baseline word _____

Activity _____	Item hidden	Line up containers, show an item under one. Child retrieves the item (repeat) Blindfold the child. Hide item. Remove blindfold	Where	Location 1(a)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 2(a)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 1(b)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

TEACHING DATA SHEETS CMEO 1- HIDE-AND-SEEK- (1) WHERE

PARTICIPANT _____   Trainer _____
Date (MM/DD/Y) _____   IOR/PR_____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response or NR on step 4)

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1(a)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step ___ Env _____	Check if prompt was delivered at correct time – leave blank if child made an ind response		PD ☐	Error: Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2(a)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step ___ Env _____	Check if prompt was delivered at correct time – leave blank if child made an ind response		PD ☐	Error: Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1(b)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed ☐
Prompt delay step ___ Env _____	Check if prompt was delivered at correct time – leave blank if child made an ind response		PD ☐	Error: Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2(b)
X = step NOT followed √ = step followed	☐	Followed script☐		Correct: Followed script ☐
Prompt delay step ___ Env _____	Check if prompt was delivered at correct time – leave blank if child made an ind response		PD ☐	Error: Re-present trial ☐ Prompt ☐

TEACHING DATA SHEETS CMEO 2- MISSING ITEM- (1) WHERE

PARTICIPANT _____   Trainer _____
Date (MM/DD/Y) _____   IOR/PR_____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response or NR)

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(a)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Prompt delay step ___ **Env** _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial Prompt	☐ ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2(a)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Prompt delay step ___ **Env** _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial Prompt	☐ ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1(b)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed	☐
Prompt delay step ___ **Env** _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial Prompt	☐ ☐
Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2(b)	
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script	☐
Prompt delay step ___ **Env** _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial Prompt	☐ ☐

DATASHEET – GENERALIZATION- NOVEL ACTIVITY AND LOCATION – WHERE?

PARTICIPANT_____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NO RESPONSE - NR)

CMEO 4	Item hidden	(experimenter says nothing)	Where	(Name Location 3a)
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

CMEO 3	Item hidden	(experimenter says nothing)	Where	(Name Location 3b)
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

CMEO 2	Item hidden	(experimenter says nothing)	Where	(Name Location 3b)
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

CMEO 1	Item hidden	(experimenter says nothing)	Where	(Name Location 3a)
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

FOLLOW-UP DATASHEET- CMEO 1. HIDE-AND-SEEK –WHERE

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 1.
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2.
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(experimenter says nothing)	Where	Location 2.
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

FOLLOW-UP DATASHEET- CMEO 2. MISSING ITEM –WHERE

PARTICIPANT _____

ONE WEEK

Date (MM/DD/Y) _____   Trainer _____

Follow-up word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR on step 4)

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated☐

Appendix H.
LOCATION PRE-TEACHING DATASHEET -WHICH

Participant _____

Date _____

Score _____

Location 1a: _____   Location 2a: _____   Location 3a : _____

Location 1b: _____   Location 2b: _____   Location 3b : _____

Location "Go get what is inside the ____"	INTEROBSERVER RELIABILTY		PROCEDURAL RELIBILITY	
	INDEPENDENT RESPONSE	ERROR	Correct S^D	Correct Consequence
2b.				
2a.				
1b.				
1a.				
3b.				
1b.				
1a.				
3b.				
2a.				
1a.				
3a.				
1b.				
1b.				
2a.				
1a.				
2b.				
3a.				
3a.				
3a.				
3b.				
2a.				
3b.				
2b.				
3a.				
1b.				
2b.				
1a.				
3b.				
2a.				
2b.				

GENERALIZATION TO NATURAL ENVIRONEMENT –DATASHEET – WHICH?

Trainer _____   IOR/PR _____

Participant _____

Date _____   script used by the parent _____

Mand _____

Score [(spontaneous/spont+missed)*100] _____

PHASE OF THE STUDY (circle)   BEFORE STARTING STUDY   AFTER MASTERY OF CMEO_____

INTEROBSERVER RELIABILTY				PROCEDURAL RELIBILITY		
Spontaneous mand made		Missed opportunity		Experimenter gave rules to parent before starting	Y	N
With a statement	Without a statement	With a statement	Without a statement	Experimenter did not interact with parents or child	Y	N

> RULES
>
> 1. Interact with your child for the entire hour
>   E.g., Play
>   Teach a skill (e.g., how to share,
>   play, cook, art and craft)
>
> 2. Do not prompt your child to use the target WH request
>
> 3. Contrive opportunities for your child to request using the target request
>   => use on the scripts provided at least once
>
> 4. Do not use any of the activities that are being used or will be used in the study.
>
> 5. Avoid doing solitary activities (e.g., watching a movie, playing on the computer)
>
> 6. Other family members can be present (e.g., siblings, other parent)

MISSED OPPORTUNITY – WHICH
A missed opportunity was defined as when a parent asks their child to do/get/find/look/search for etc.
something and 2 or more options about the item specified by the parent are available and the child must ask
"Which?" to correctly select the correct item to do/get/find/look/search etc. OR the child begins to actively
look in all possible locations for an item (e.g., looking in all boxes) instead of asking "Which?". "Which?".
*Example: Give me the policeman (several present); Get the ___ in the box (several boxes present); take the
____ out of my hand (closed hands presented;, upon saying where the name of the location is given however
there are several items out that could be possibilities.)*

BASELINE DATA SHEETS CMEO 1 -HIDE AND SEEK –WHICH?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

| I = Ind (no prompt) |
| E = Error (wrong response or NR) |
| P = prompt |

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

BASELINE DATA SHEETS CMEO 2- MISSING ITEM–WHICH?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

| I = Ind (no prompt) |
| E = Error (wrong response or NR) |
| P = prompt |

Baseline word _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

BASELINE DATA SHEETS CMEO 3 –REQUIRING MORE –WHICH?

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR)
P = prompt

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

BASELINE DATA SHEETS CMEO 4 –SURPRISE –WHICH?

PARTICIPANT _____
Date (MM/DD/Y) _____   Trainer _____
Baseline word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR)
P = prompt

Activity _____	Item hidden	Line up containers, show an item under one. Child retrieves the item (repeat) Blindfold the child. Hide item. Remove blindfold	Where	Location 1	Which	(1a)
X = step NOT followed √ = step followed	☐	Followed script ☐		Correct: Followed script ☐		Correct: Followed script ☐
Env _____						Error: Trial terminated ☐
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 2	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script ☐		Correct: Followed script ☐		Correct: Followed script ☐
Env _____						Error: Trial terminated ☐
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 1	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script ☐		Correct: Followed script ☐		Correct: Followed script ☐
Env _____						Error: Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

BASELINE DATA DISCRIMINATION TEACHING– WHERE VS WHICH?
CMEO (circle)   1   2   3

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

Baseline word _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR)
P = prompt

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.		
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		
Env _____				**Error:** Trial terminated ☐		
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.		
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		
Env _____				**Error:** Trial terminated ☐		

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

BASELINE DATA DISCRIMINATION TEACHING – CMEO 4, SUPRISE– WHERE VS WHICH?

PARTICIPANT _____
Date (MM/DD/Y) _____   Trainer _____
Baseline word _____   IOR/PR Person _____

| I = Ind (no prompt) |
| E = Error (wrong response or NR) |
| P = prompt |

Activity _____	Item hidden	Line up containers, show an item under one. Child retrieves the item (repeat) Blindfold the child. Hide item. Remove blindfold	Where	Location 1.		
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		
Env _____				**Error:** Trial terminated ☐		
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
SCRIPT: A Activity _____	Item hidden	Line up containers, show an item under one. Child retrieves the item (repeat) Blindfold the child. Hide item. Remove blindfold	Where	Location 1.	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐
Activity _____	Item hidden	Child is shown an item in a box, and box gets locked (key is hidden).	Where	Location 2.		
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		
Env _____				**Error:** Trial terminated ☐		

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY IN CMEO _____

TEACHING DATA SHEETS CMEO 1- HIDE-AND-SEEK- (1) WHICH

PARTICIPANT _____

Date (MM/DD/Y) _____

Trainer _____

IOR/PR_____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response)

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1	Which	(1a).
X = step NOT followed √ = step followed	☐	Followed script		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial ☐ Prompt ☐	PD ☐	**Error:** Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial ☐ Prompt ☐	PD ☐	**Error:** Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1	Which	(1b).
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial ☐ Prompt ☐	PD ☐	**Error:** Re-present trial ☐ Prompt ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2	Which	(2b).
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Re-present trial ☐ Prompt ☐	PD ☐	**Error:** Re-present trial ☐ Prompt ☐

DISCRIMINATION TEACHING DATA SHEETS CMEO 1- HIDE-AND-SEEK- (1) WHERE VS WHICH (PAGE 1)

PARTICIPANT _____
Date (MM/DD/Y) _____   Trainer _____
Teaching word _____   IOR/PR Person _____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response)

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2a		
X = step NOT followed √ = step followed	☐	Followed script ☐		**Correct:** Followed script ☐		
Prompt delay step __ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Interrupt/block ☐ Explanation ☐ Prompt "Where" ☐		

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1a		
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Interrupt/block ☐ Explanation ☐ Prompt "Where" ☐		

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2	Which one	(2a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Interrupt/block ☐ Prompt ☐	PD ☐	**Error:** Interrupt/block ☐ Explanation ☐ Prompt "Where"/which one ☐

DISCRIMINATION TEACHING DATA SHEETS CMEO 1- HIDE-AND-SEEK- (1) WHERE VS WHICH (PAGE 2)

PARTICIPANT _____

Date (MM/DD/Y) _____   Trainer _____

 Teaching word _____   IOR/PR _____

I = Ind (no prompt)
FP = Full Prompt (gave all answer)
PP = Partial Prompt (gave part of answer)
E = Error (wrong response)

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2	Which one	(2b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Prompt delay step __ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Repeat statement ☐ Prompt ☐	PD ☐	**Error:** ☐ Interrupt/block ☐ Explanation Prompt "Where"/which one" ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1	Which one	(1b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Interrupt/block ☐ Prompt ☐	PD ☐	**Error:** Interrupt/block ☐ Explanation ☐ Prompt "Where"/which one" ☐
Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2(b)		
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		
Prompt delay step ___ **Env _____**		Check if prompt was delivered at correct time – leave blank if child made an ind response	PD ☐	**Error:** Interrupt/block ☐ Explanation ☐ Prompt "Where" ☐		

DATASHEET – GENERALIZATION- NOVEL ACTIVITY AND LOCATION – WHICH?

PARTICIPANT ____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

I = Ind (no prompt)
E = Error (wrong response or NR)
P = prompt

CMEO 4	Item hidden	(Experimenter says nothing)	Where	Location 3	Which	(3b)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

CMEO 3	Item hidden	(Experimenter says nothing)	Where	Location 3	Which	(3a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

CMEO 2	Item hidden	(Experimenter says nothing)	Where	Location 3	Which	(3a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

CMEO 1	Item hidden	(Experimenter says nothing)	Where	Location 3	Which	(3b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT ___

DATASHEET – GENERALIZATION- NOVEL ACTIVITY AND LOCATION – WHERE vs WHICH?

PARTICIPANT ____   Trainer _____

Date (MM/DD/Y) _____   IOR/PR Person _____

CMEO 4	Item hidden	(Experimenter says nothing)	Where	Location 3	Which one	(3b)
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

CMEO 3	Item hidden	(Experimenter says nothing)	Where	Location 3
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				**Error:** Trial terminated ☐

CMEO 2	Item hidden	(Experimenter says nothing)	Where	Location 3	Which one	(3a).
X = step NOT followed √ = step followed	☐	Correct script ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

CMEO 1	Item hidden	(Experimenter says nothing)	Where	Location 3
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐
Env _____				

PHASE OF THE STUDY (circle)   BEFORE STARTING ANY TEACHING   OR   AFTER MASTERY OF PARTICIPANT __

FOLLOW-UP DATASHEET- CMEO 1. HIDE-AND-SEEK –WHICH?

PARTICIPANT _____   **ONE WEEK**
Date (MM/DD/Y) _____   Trainer _____

| I = Ind (no prompt) |
| E = Error (wrong response or NR) |
| P = prompt |

Follow-up word _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 1.	Which	(1a).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

TWO WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2b).
X = step NOT followed √ = step followed	☐	Followed script☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐

FOUR WEEK

Date (MM/DD/Y) _____   Trainer _____   IOR/PR Person _____

Activity _____	Item hidden	(Experimenter says nothing)	Where	Location 2.	Which	(2a).
X = step NOT followed √ = step followed	☐	Followed ☐		**Correct:** Followed script ☐		**Correct:** Followed script ☐
Env _____						**Error:** Trial terminated ☐