The Role of the Motivating Operation in Teaching Children with Autism

Vincent J. Carbone Ed.D., BCBA-D
NYS Licensed Behavior Analyst

Carbone Clinic
New York – Boston – Dubai
www.CarboneClinic.com

IESCUM
Parma, Italy
December 1, 2 & 3, 2016

The Basic Principles Related to The Strength of the Operant

<table>
<thead>
<tr>
<th>ANTECEDENT</th>
<th>BEH</th>
<th>CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$S^D$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Delta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$S^P$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond and Uncond</td>
</tr>
<tr>
<td>Surrogate, Transitive, Reflexive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos. and Neg. and Automatic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extinction</th>
</tr>
</thead>
</table>

Michael refers to behavioral variables that serve as consequences as function altering variables. In other words, they alter the function of stimuli that are correlated with the behavior consequence relation, e.g. antecedent stimuli.

He refers to antecedent behavioral variables as behavior altering in that they momentarily alter some dimension of behavior, e.g. MO’s and SD’s.

For a complete overview of his analysis of this topic, see Jack Michael’s Concepts and Principles (2003).
MOTIVATING OPERATIONS

Credit

- A number of the slides contained in this presentation were developed and presented in other contexts by Dr. Jack Michael, and have been placed without modification into this presentation with Dr. Michael’s permission.
Definitions of Important Terms
and Concepts

Papers
Michael 1982, JEAB
McGill, 1999, JABA
Laraway et al, 2003 JABA
Langthorne and McGill, 2009 BAP
Carbone, et al., 2010 Focus on Autism...
Laraway et al., 2014 Psychological Record

Motivating Operations

- When discussing motivation behavior analysts make use of the concept of establishing operation (Michael, 1982) and then later the motivating operation (Laraway, Syncerski, Michael & Poling, 2003)

- In this talk about teaching children with autism I will discuss two important motivational variables; the conditioned reflexive motivating operating (CMO-R) and the conditioned transitive motivating operation (CMO-T)

- We’ll start our discussion with a brief overview of the development of the concept of the motivating operation and then discuss how these concepts relate to the teaching of children with autism.
Brief History of Motivation In Behavior Analysis

- Motivation in behavior analysis has frequently been confused with the role of reinforcement as a consequence.

- The clear identification of motivation as an environmental variable as an antecedent event began with the publication of B. F. Skinner’s *Behavior of Organisms* (1938).

- Skinner included two chapters devoted to motivation.

- He argued against the term “drive.” Skinner asserted that, “The ‘drive’ is a hypothetical state interpolated between operation and behavior and is not actually required in a descriptive system.” (p. 368)

- Moreover, he differentiated between motivational control and stimulus control by declaring that a “Drive is Not a Stimulus”.

- He relied on the operations of deprivation/satiation and presentation of aversive stimuli to describe motivation.

- Keller and Schoenfeld’s book *Principles of Psychology* (1950)

  - This book contained a chapter devoted to and titled “Motivation.” It contained several refinements to the topic of motivation (Sundberg, 2005)

    - They further developed the analysis of deprivation/satiation and response strength.

    - They provided detailed analysis of how an aversive stimulus can function as a motivational variable.
Keller and Schoenfeld gave a name to a newly discovered behavioral variable, “The establishing operation (my emphasis) is our independent variable, the behavior our dependent variable; the former is specifiable as to kind and degree, the latter is measured by the extent of change. The concomitant variation of the two gives rise to, and defines, the concept and problem of motivation” (Keller & Schoenfeld, 1950, p. 273).

In the book Verbal Behavior (1957) Skinner provided a comprehensive analysis of how motivational variables contribute to a human’s initial acquisition of language (Sundberg, 2005).

It is here that he introduced the concept of the mand and argued that it was separate from the other operants because of its control by motivational variables, rather than discriminative stimuli. He also described how motivational variables could be manipulated to evoke verbal behavior.

Refinement of the Concept of the EO

Through a series of writings, Michael (1982; 1988; 1993; 2000; 2007) refined the concept and principle of the establishing operation (EO) and defined it as an: “environmental event, operation, or stimulus condition that affects an organism by momentarily altering a) the reinforcing value of other events and b) and alters the frequency of behavior that has produced what is now valued”.

Michael (1993) described two (2) types of EOs: Unconditioned and Conditioned. Unconditioned EOs (UEOs) are “events or operations or stimulus conditions whose value altering effects are unlearned,” Conditioned EOs (CEOs) “value altering effects have been learned during the individual organism’s learning history.”
Michael (1993) identified and for the first time clearly described three (3) different types of CEOs or CMOs. There are three types of CMOs as described by Michael (1993, 2007):

1. Conditioned Transitive Motivating Operation (CMO-T)
2. Conditioned Reflexive Motivating Operation (CMO-R)
3. Conditioned Surrogate Motivating Operation (CMO-S)

All three (3) have been implicated as behavioral variables within the applied research related to the treatment of persons with autism and developmental disabilities. (For a review of the CMO-R and CMO-T see, Carbone, 2013).

As a result of Michael's writings on the topic and terminological revision from “establishing operation” (EO) to “motivating operation” (MO), (Laraway, Syncerski, Michael & Poling, 2003) the concept gained recognition as an important variable in clinical practice.

---

Establishing Operations (EOs)
Two Defining Effects

**Reinforcer Establishing Effect**
EO’s alter the current reinforcing effectiveness of some stimulus, object, or event. (And reinforcer establishing should be taken to include the effect in the opposite direction, called reinforcer abolishing.)

**Evocative Effect**
EO’s alter the current frequency of all types of behavior that have been reinforced by the same stimulus, object, or event that is altered in reinforcing effectiveness by the same EO. (And evocative should be taken to include the effect in the opposite direction, called abative.)
A Change in Terms from EO to MO

• This Laraway et al. (2003) paper proposed that behavior analysts should consider using value altering effect to replace reinforcer establishing effect as a generic description of a change in the effectiveness of any operant consequence (411).

• “Value-altering effects comprise the (a) reinforcer-establishing, (b) reinforcer-abolishing, (c) punisher-establishing, and (d) punisher-abolishing effects of MOs (Laraway 411).

• In addition, the authors proposed that instead of using evocative effect in the bidirectional sense advocated by Michael, in the interest of accuracy, behavior analysts should consider using behavior-altering effect as a generic description of MOs’ effects on behavior (411).

• They suggested to use the verb evoke to describe an increase and the verb abate to describe in responding due to the action of antecedents.
  – Two effects are then possible: An Evocative Effect and an Abative Effect.
In other words, motivating operations:

- **EVOKE or ABATE** a response. This is called the **BEHAVIOR-ALTERING EFFECT**.
- **ESTABLISH or ABOLISH** the reinforcing value of another stimulus. This is called the **VALUE-ALTERING EFFECT**.

Michael (1993, 2007) states that motivating operations have two defining features:

1. They alter the reinforcing value upward or downward of some other stimulus.
2. They alter some dimension of a response associated with the change in reinforcing value of a stimulus that has followed it.

In other words, motivating operations:

1. **ESTABLISH** or **ABOLISH** the reinforcing value of another stimulus. This is called the **VALUE-ALTERING EFFECT**. The two terms for the value altering effects are Establishing Operation and Abolishing Operation.
2. **EVOKE** or **ABATE** a response. This is called the **BEHAVIOR-ALTERING EFFECT**. The two terms for the behavior altering effects are Evocative Effect and Abative Effect.

---

### Table of MO Effects

<table>
<thead>
<tr>
<th>Motivative Operations (MOs)</th>
<th>Two Defining Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value-Altering Effect</strong></td>
<td>MOs alter the current reinforcing effectiveness of some stimulus, object, or event.</td>
</tr>
<tr>
<td>Reinforcer</td>
<td>Reinforcer</td>
</tr>
<tr>
<td>Establishing Effect</td>
<td>Abolishing Effect</td>
</tr>
<tr>
<td>food deprivation increases effectiveness of food as reinforcer</td>
<td>food ingestion decreases effectiveness of food as reinforcer</td>
</tr>
</tbody>
</table>

| **Behavior-Altering Effect** | MOs alter the behavior of all types of responding that have been reinforced by the same stimulus, object, or event that is altered in value by the same MO. |
| Abative Effect               | Abative Effect         |
| Evocative Effect             | Evocative Effect       |
| increase in the current freq. of all behavior that was reinforced with food. | decrease in the current freq. of all behavior that was reinforced with food. |

---

**Definition**

- A motivating operation is any set of events, stimulus, or condition that alters the value of some stimulus as a reinforcer or punisher and alters the frequency of some response that has produced that consequence (Michael, 1993).

- Michael (1993, 2007) states that motivating operations have two defining features:
  1. They alter the reinforcing value upward or downward of some other stimulus
     and
  2. They alter some dimension of a response associated with the change in reinforcing value of a stimulus that has followed it.

---
Examples

• **Food deprivation** is a motivating operation because it:
  
  1. Alters upward the value of food as a reinforcer (Establishing Effect)
     And
  
  2. Evokes all behaviors that have, in the past, produced food as a form of reinforcement (Evocative Effect)

• **Food ingestion** (satiation) is a motivating operation because it:

  1. Alters downward the value of food as a reinforcer (Abolishing Effect)
     And
  
  2. Abates all behaviors that have, in the past, produced food (Abative Effect).

\[ ACTIVITY \ # \ 1 \]

\[ ACTIVITY \ # \ 2 \]
A Critical Distinction: Motivating vs. Discriminative Relations; EO vs. $S^D$

**Definition of $S^D$**: A stimulus that has been positively correlated with the availability of reinforcement for a class of responses.

**Definition of an MO**: A stimulus, event or operation that establishes or abolishes the value of another stimulus and therefore either evokes or abates any behavior that produces that stimulus.

**The General Contrast**

- Both EOs and $S^D$s are learned, operant, antecedent, evocative/abative relations.
- $S^D$s evoke ($S^A$s abate) because of the differential availability of a reinforcer.
- EOs evoke or abate because of the differential effectiveness of a reinforcer.

---

**ACTIVITY**

Is it an $S^D$ or an MO?

**Test# 1**

1. Does the antecedent stimulus or operation alter the value of the consequence or alter the availability of the consequence? In most cases the question is: "Is reinforcement now more valuable or more available?"
Is it an SD or an MO?

TEST # 2

1. Does the antecedent stimulus or operation alter the value of the consequence or alter the availability of the consequence? In most cases the question is: “Is reinforcement now more valuable or more available?

2. TEST # 2: Can the conditions necessary to develop an SD occur?

The first test is fairly straightforward in most cases.

The second test is a little more complicated and discussed on the next few slides.
Development of an $S^D$

Both Conditions Must Occur

Skinner video

1. **$S^D$ Condition:** MO - Stimulus - Response - $Sr^+$

2. **$S^\Delta$ Condition:** MO - **NO Stimulus** - Response - **NO $Sr^+$**

**EXAMPLE**

Light On as an $S^D$

- **$S^D$ Condition:** Food Deprivation/ light on - R - Food Reinforcer
- **$S^\Delta$ Condition:** Food Deprivation/ light off - R - NO food Reinforcer

Note first that in both conditions necessary for the development of an $S^D$, motivation for the scheduled reinforcer must be above a value of zero and to be most effective the motivation should be of high value.

Over time the events depicted above (history) results in differential availability of reinforcement in the presence of the stimulus and therefore evokes behavior that has produced the reinforcer in the $S^D$ condition and suppresses responding the $S^\Delta$ condition due to extinction.

---

**TEST for: Food Deprivation as a Possible $S^D$?**

Is food more valuable or available when deprived of food? Answer is straight forward.

But second test requires the following:

Two $S^D$ requirements: (1) Food wanted, R has been reinforced with food in $S^D$ and (2) Food wanted, R has occurred w/o food rfmt. in $S^\Delta$,

- **$S^D$ Condition:** MO - Stimulus - Response - $Sr^+$
  - Food Deprivation - Food Deprivation------ Pecking ---- Food

- **$S^\Delta$ Condition:** MO - **NO Stimulus** - Response - **NO $Sr^+$**
  - Satiation/No MO Satiation Pecking? No Food

(1) **SD Condition (Food Deprivation):** Food deprivation meets the first requirement. Food has been available and has typically followed R in the presence of food deprivation.

(2) **S-Delta Condition (Satiation)** R may have occurred w/o being followed by food in $S^\Delta$, but when deprivation was not present (during food satiation) food would not have been effective as reinforcement.

The decrease in responding in this case was not due to extinction.

Note that the S-Delta condition can not meet the requirement necessary to develop an $S^D$.

*Food deprivation is an MO not an $S^D$*
TEST for: Pain as a Possible S^D?

Is pain reduction (reinforcer) more available or valuable when in pain? Again, answer is straightforward.

But what about the second test requirements,

Two S^D requirements: (1) Pain Present, R has been reinforced with pain reduction in S^D (painful stim. present) and (2) Pain Present R has occurred w/o pain reduction rfmt. in S^D.

S^D Condition: MO - Stimulus - Response - Sr+ Pain - Pain ------ Pecking ---- Pain Reduction

S^D Condition: MO - NO Stimulus - Response - NO Sr+ No Pain /No MO No Pain Pecking? No Pain Reduction

(1) Pain (Sd) Pain reduction has been available and typically followed R in the presence of pain.

(2) NO Pain (S-Delta) R may have occurred w/o being followed by pain reduction in S^D but when pain reduction was not present pain reduction was not effective as reinforcement.

Any decrease in responding is not due to extinction.

Note that the S-Delta condition can not meet the requirement necessary to develop an S^D.

Pain is an MO not an S^D

Summary of Differences

• Discriminative stimuli evoke or abate behavior due to their positive or negative correlation with the availability of reinforcement.

• Motivating Operations evoke or abate behavior because of their value altering and behavior altering effects.

• They have the same effect but their mechanisms for evoking behavior are quite different and therefore they are different behavioral variables.

• Failure to distinguish between the two will result in less effective clinical practices.
The Establishing Operation and Teaching Verbal Behavior

Vincent J. Carbone, Carbone Clinic

Twenty years ago Michael (1993) refined and extended the concept of the conditioned establishing operation (CEO). With this paper he updated his previous treatment of the topic (Michael, 1982) by providing terminological refinements and conceptually clear descriptions of the reflexive and transitive CEOS. In the 20 years since the publication of that paper there has been an increase in the application of CEOS as independent variables in the teaching of verbal behavior in applied setting. The purpose of this paper is to provide a brief overview of clinical applications of the EO to the teaching of verbal behavior during the last 20 years.

*Key words:* applied, establishing operation, motivation, verbal behavior

SKINNER’S CLASSIFICATION OF LANGUAGE
Behavioral Classification of Language
Skinner’s (Nature’s) Categories

Motivation and Teaching the Mand

- The Mand is a verbal operant that specifies its reinforcer and therefore is under the control of motivation or a motivating operation.

- While Skinner never used the term establishing or motivating operation he clearly identified the role of motivation in the acquisition of the mand repertoire.

- He described the mand as under the control of conditions of deprivation/satiation and aversion.

- He identified the mand as the only verbal operant that was not under the control of a discriminative stimulus but instead motivation.

- Consequently, there are advantages of teaching the mand almost immediately in training programs for children with autism. (See Sundberg & Michael, 2010, for a complete analysis)

- First of all, when motivation is high the mand may be the easiest verbal skill for a child to acquire initially.
• Next, the child learns a method to effectively control the social environment and therefore may reduce problem behavior.

• Mand teaches the speaker listener relationship that will be necessary for the development of complex social behavior and other verbal responses.

• It appears the mand may teach the first appropriate type of social initiation to some children.

• Mand training correlates other persons (listeners) with reinforcement and therefore may help to condition the attention of others as a reinforcer.

• Manding benefits the speaker and therefore should make language training overall easier for the child and the teachers.

• Therefore, it would be quite reasonable for mand training to be the focus of early language training programs. (Sundberg & Michael, 2010)

Teaching Procedures for Mand Training

**VOCAL MANDING**

Echolalic to Mand Transfer

<table>
<thead>
<tr>
<th>Establish MO</th>
<th>Vocal Prompt</th>
<th>Mand</th>
<th>Reinforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Item Prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fade Vocal Prompt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fade Item</td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td><strong>MAND</strong></td>
<td>Reinforce</td>
</tr>
</tbody>
</table>

**MANUAL SIGN MANDING**

Mimetic to Mand Transfer

<table>
<thead>
<tr>
<th>Establish MO</th>
<th>Vocal Prompt</th>
<th>Mand</th>
<th>Reinforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Item Prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical Prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Model Prompt</td>
<td><strong>MANDING VIDEOS</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td><strong>MAND</strong></td>
<td>Reinforce R</td>
</tr>
</tbody>
</table>
Transferring Control of the Mand to the Motivating Operation in Children with Autism

Emily J. Sweeney-Kerwin, Vincent J. Carbone, Leigh O’Brien, Gina Zecchin, and Marietta N. Janecky, Carbone Clinic

Few studies have made use of B. F. Skinner’s (1957) behavioral analysis of language and precise taxonomy of verbal behavior when describing the controlling variables for the mand relation. Consequently, the motivating operation (MO) has not typically been identified as an independent variable and the nature of a spontaneous mand has been imprecisely described. The purpose of this study was to develop procedures to bring the mand response under the control of the relevant MO and therefore free it from the multiple controls that are more easily identified by practitioners who rely on Skinner’s analysis and taxonomy. Using a rolling time delay and prompt fade procedure both participants’ mand repertoires were successfully transferred to the relevant MO and a listener and described within the context of a behavioral analysis of language.

Key words: verbal behavior, motivating operation, mand, autism.
Figure 2. Frequency of MO controlled mands per session during baseline (BL) and treatment conditions for Jeff.

The Role of the Conditioned Reflexive Motivating Operation (CMO-R) During Discrete Trial Instruction of Children with Autism
CEO-R
ANIMAL LABORATORY EXAMPLE

Reflexive MO Definition: Warning Stimulus
When a previously neutral stimulus is correlated with a worsening set of conditions, presentation of that stimulus:
Value Altering Effect- establishes termination of the stimulus as a reinforcer.
Behavior Altering Effect – evokes all behaviors that have terminated the stimulus.

J. Michael
R1 = lever press, the avoidance rsp.  R2 = chain pull, the escape rsp.
CEO-R Class Exercise
Assume that the organism has had exposure to the escape avoidance paradigm displayed in the previous slide, answer the following:

Human examples
Everyday social interactions.

- The CEO-R is important in identifying a negative aspect of many everyday interactions that might seem free of deliberate aversiveness. The interactions are usually interpreted as a sequence of $S^D\rightarrow R$ interactions, with each one being an opportunity for one person to provide some form of rfmt to the other person. But there is a slightly darker side to everyday life.
i. **Response to a request** for information: You are on campus and stranger asks you where the library is. The appropriate R is give the information or say that you don't know. What evokes your answer? The request. What reinforces your response? The person asking will smile and thank you. Also you will be rfed by the knowledge that you have helped another person.

**CEO-R**  **Human examples**  
**Everyday social interactions**  
(cont'd.)

So the request is an $S^D$. But, it also begins a brief period that can be considered a warning stimulus, and if a rsp is not made soon, some form of mild social worsening will occur. The asker may repeat the question, more clearly or loudly, and will think you are strange if you do not respond. You, yourself, would consider your behavior socially inappropriate if you did not respond quickly.
Even with no clear threat implied for non-responding, our social history implies some form of worsening for continued inappropriate behavior. So, the request plus the brief following period is in part a CEO-R in evoking the response. It is best considered a mixture of positive and negative parts. But when the question is an inconvenience (e.g. when you are in a rush to get some-where) the CEO-R is probably the main component.

Human examples
Everyday social interactions (cont'd.)

ii."Thanks"

When a person does something for another that is a kindness of some sort, it is customary for the recipient of the kindness to thank the person performing the kindness, who then typically says "You're welcome." What evokes the thanking rsp, and what is its rfmt?
Clearly it is evoked by the person's performing the kindness. And the "You're welcome" acknowledgment is the obvious rfmt. So the kindness is an $S^0$ in the presence of which a "Thanks" response can receive a "You're welcome." But what if the recipient fails to thank the donor? The performance of the kindness is also a CEO-R that begins a period that functions like a warning stimulus. Failure to thank is inappropriate.

Clinical Application of the CMO-R

- DEFINITION OF CMO-R, any stimulus which has been repeatedly correlated with a worsening set of conditions will come to function as a CMO-R, in that the onset of this stimulus will establish its own termination (removal) as a form of reinforcement and will evoke any behaviors that have previously produced such reinforcement.

- An analysis of the typical instructional setting for many learners with autism provides an example of the development of CMO-R:

  - The teaching of some children with autism requires the presentation of many instructional demands each day.

  - Many of these learners have a history that has established the presence of the teacher, the teaching context, and the presentation of the instructional demand as an aversive condition and therefore evokes problem behavior which interferes with learning. Michael (1993, 2000) identifies these antecedent stimuli as reflexive conditioned establishing operations (changed to condition reflexive motivating operations (CMO-R) in 2003).

  - Consistent with this analysis, teacher presence, instructional materials, and teacher instructional demands may all act as CMOs-R for some learners and therefore evoke problem behavior that interferes with learning. The reported high rates of problem behavior evoked by discrete trial training with some children (Lovaas, 1982, 2003) may be related to the CMO-R.
Discrete Trial Instruction

- Discrete trial instruction (DTI) has been demonstrated to be an effective method of treatment and education for persons with autism (Smith, 2001).

- The instructional method includes a teacher presenting instructional material in a precise and sequenced manner so that it evokes frequent responses to the material by the learner.

- Following each learner response the teacher presents a consequence that usually takes the form of some type of feedback that either indicates the responses are correct or incorrect.

- Correct responses usually result in a suspected form of reinforcement to strengthen the responses.

- Following incorrect responses the teacher provides feedback indicating an error and usually conducts an error correction procedure.

- The instructional demands could be in the form of presentation of verbal responses of the teacher (What is it? Touch your nose, etc.), presentation of nonverbal stimuli (pictures, objects to match), or some combination of both (Tell me which one you drink from).

  - WHAT SKILLS ARE TAUGHT USING DTI?

- DTI instruction can be used to teach almost any skill in any environment.

- In this context we are talking about teaching skills that are representative of the core deficits of persons with autism at a desk or instructional table.
The skills taught during DTI at an instructional table usually include the following:

1. listener behavior (commands and selection)
2. tacting (labeling)
3. motor imitation
4. visual performance (matching, sorting, etc.)
5. intraverbal behavior (responding to what is said)
6. echoic responses

For our purposes today we are specifically discussing DTI in the context of presentation of instructional demands by an instructor at a table during one-on-one instruction.

Sylvia Video

A thorough conceptual understanding of motivation and a well-developed practical repertoire related to modifying instructional variables that will reduce the aversiveness of teaching and reduce problem behavior maintained by escape or avoidance can result in a more comprehensive analysis of an instructional situation and improved selection of appropriate instructional methods. (Michael, 2000).
• Let’s first look at an infrahuman experimental preparation related to the CMO-R.

• Then we’ll look at the following two diagrams to discuss an applied clinical example. The following two diagrams depict an experimental preparation related to the development of a discriminated avoidance response. In other words, they show an analysis of how stimuli might be engendered with aversive properties and conditioned as CMO-R.

• The first diagram presents an analysis of how this occurs in the animal laboratory setting.

• The second diagram presents an analysis of how this occurs in the context of teaching.

• Both examples show how a previously neutral stimulus, after being consistently followed by a worsening set of conditions, comes to function as a warning stimulus for that worsening set of conditions. As a result, an avoidance response comes to be evoked by the presentation of the warning stimulus.
## Development of the CMO-R in the Laboratory

<table>
<thead>
<tr>
<th>Neutral Stimulus</th>
<th>“Painful Stimulation”</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tone</td>
<td>Shock</td>
<td>Termination of Worsening Condition is a Reinforcer &amp; Evokes Behavior That Has Been So Reinforced</td>
</tr>
<tr>
<td>Presentation of Stimulus, Object or Event</td>
<td>Worsening Set of Conditions</td>
<td>=</td>
</tr>
</tbody>
</table>

### After repeated correlations in the above sequence…

**Warning Stimulus** (CMO-R)  
**Effects**

<table>
<thead>
<tr>
<th>Presentation of Stimulus, Object or Event</th>
<th>Establishes Termination of Warning Stimulus (tone) as a Reinforcer and Evokes Behavior That Has Led to its Termination</th>
</tr>
</thead>
</table>

### After repeated presentations of the above sequence……..

**Warning Stimulus** (CMO-R)  
**Effects**

<table>
<thead>
<tr>
<th>Presentation of Instructional Demands, Instructional Materials and Presence of Teacher</th>
<th>Establishes Termination of the Warning Stimuli as a Reinforcer and Evokes all Responses That Have Led to Their Removal</th>
</tr>
</thead>
</table>
Development of the CMO-R in the Classroom

<table>
<thead>
<tr>
<th>Neutral Stimulus</th>
<th>“Painful Stimulation” (Worsening Set of Conditions)</th>
<th>Effects</th>
</tr>
</thead>
</table>
| Presentation of Instructional Demands, Instructional Materials and Presence of Teacher | • Session Begins with Removal of Positive Reinforcement  
• Low value Positive Reinforcement  
• Low rate of Positive Reinforcement  
• Frequent Social Disapproval  
• Effortful Responses Required  
• Difficult Responses Required  
• High Rate of Demands  
• Frequent Learner Errors  
• Delayed Positive Reinforcement  
• Low magnitude Positive Reinforcement | Termination of Worsening Condition is a Reinforcer & Evokes Behavior That Has Been so Reinforced |

Implications for Instruction

• When trying to reduce problem behavior that occurs during instruction, three methods of treatment are frequently used:  
  • Differential reinforcement plus extinction  
  • Functional communication training (FCT) plus extinction  
  • Abolish the CMO-R

• Michael (2000) suggests a practical solution to this problem may involve the use of escape extinction (i.e., maintain demands when problem behavior occurs). In fact, escape extinction along with differential reinforcement of alternative behaviors (DRA) is the most common form of intervention for learners with autism who emit problem behavior when instructional demands are presented (Lovaas, 2003). Practitioners sometimes refer to this process as “working through” the problem behavior.

• Failure to recognize certain antecedent stimuli as reflexive MOs or mischaracterization of them as discriminative stimuli for problem behavior may stall attempts to reduce the problem behavior or may result in an over reliance on extinction (EXT). In most cases, alternative methods which do not reduce the aversiveness of the setting, such as DRA with extinction or FCT with extinction, have frequently been recommended.
• DRA involves reinforcing alternative (i.e., appropriate or desirable) behaviors. Simultaneously, reinforcement is typically withheld for occurrences of the problem behavior (EXT).

  Kyle

• One problem with this may be that if problem behavior is occurring at a high rate, there may be little opportunity to reinforce alternative appropriate behaviors.

• FCT involves the replacement of problem behavior with behavior that produces the same reinforcer that has maintained the problem behavior (Durand and Carr, 1991). Simultaneously, reinforcement is typically withheld for occurrences of the problem behavior (EXT).

     Peter Video – DRA & EXT

• McGill claims that merely replacing problem behavior and not altering the EO may raise ethical concerns since FCT methods leave in place a “counterhabilitative environment” and may lead to only temporary changes in behavior since the circumstances evoking the behavior remain in place.

• In addition, FCT results in high rates of manding for removal of CMO-R (demands). If this response is not reinforced problem behavior usually occurs. If it is reinforced then very few learning opportunities are provided therefore rendering the procedure impractical.

• Notwithstanding these concerns, practitioners will frequently choose to implement either of the following procedures when instructional demands during discrete trial training evoke problem behavior:

  1. DRA + EXT – maintain the demand after problem behavior occurs as a form of extinction and then reinforce when correct responding occurs.

  2. FCT + EXT – teach the learner to request removal of the task requirement following delivery of a demand as an alternative to problem behavior.

• The decision to use of either one of these approaches, FCT or DRA, combined with EXT is typically based upon an assumption that: 1) the demands must be presented because of the importance of the skills being taught and/or 2) that the instructional setting (i.e., demands) cannot be made less aversive.

• Michael (2007) suggests the following instead:

  “...one should not assume that the ultimate phases of the demand cannot be made less aversive. Increasing instructional effectiveness will result in less failure, more frequent reinforcement, and other general improvements in the demand situation to the point at which it may function as an opportunity for praise, edibles, and so forth, rather than a demand.” (p. 387)
• In other words, an analysis of the learning history of a child in which demands have come to function as reflexive MOs, such as the one presented earlier, may suggest interventions to **abolish** the value of escape as a reinforcer and, consequently, methods to **abate** problem behavior.

**Abolishing the CMO-R in the Classroom**

**USE TEACHING PROCEDURES THAT ENSURE:**
- Teacher is paired with Sr+
- Higher value of Sr+
- Higher rate of Sr+
- Greater magnitude of Sr+
- More immediate Sr+
- Less effortful R

**ABOLISHING THE CMO-R**

<table>
<thead>
<tr>
<th>TEACHING METHODS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESENT A STIMULUS THAT ACTS AS AN ABOILISHING OPERATION</td>
<td>Initially correlate the teaching environment with highly valuable and high-density preferred stimuli. Kelly Research</td>
</tr>
<tr>
<td>MIX &amp; VARY TASKS</td>
<td>Present instructional demands in which the stimuli and response requirements vary from trial to trial. Do not mass trial across one skill or one operant.</td>
</tr>
<tr>
<td>REDUCE LEARNER ERRORS</td>
<td>Use errorless teaching methods that incorporate time delay prompting procedures. In other words, use methods that insure high levels of correct responding.</td>
</tr>
<tr>
<td>INTERSPERSE EASY AND HARD TASKS</td>
<td>Try to keep a ratio of about 80% known (i.e., easy) tasks to about 20% unknown (i.e., difficult) tasks.</td>
</tr>
<tr>
<td>FADE IN # OF DEMANDS</td>
<td>Use a VR schedule of reinforcement, but initially start by presenting a lower number of demands before delivering reinforcement. Then, gradually increase the number of demands presented before delivering reinforcement until reaching the desired VR schedule.</td>
</tr>
<tr>
<td>FADE IN EFFORT AND DIFFICULTY OF RESPONSES</td>
<td>While fading in number of demands, also gradually fade in the effort related to responding by slowly increasing the difficulty of the demands being presented. In other words, start with demands that require low effort responses and gradually increase to demands that require more effortful (i.e., more difficult) responses.</td>
</tr>
<tr>
<td>EXTINCTION</td>
<td>When problem behavior occurs, treat with extinction. For behaviors typically maintained by positive reinforcement, do not deliver the reinforcer. For behaviors typically maintained by negative reinforcement, do not allow escape to occur (i.e., maintain the demand).</td>
</tr>
<tr>
<td>IMMEDIATELY DELIVER Sr+</td>
<td>Immediately deliver reinforcement for appropriate behaviors.</td>
</tr>
<tr>
<td>PACE INSTRUCTION PROPERLY</td>
<td>Initially use the shortest inter-trial interval (ITI) possible. This should typically start off around 1–2 seconds.</td>
</tr>
</tbody>
</table>

**EVOKES COOPERATIVE BEHAVIOR THAT PRODUCES TEACHER MEDIATED POSITIVE REINFORCERS (RESPONSES TO TEACHER PRESENTED INSTRUCTION DEMANDS)**
In the ABA literature, antecedent curricular revisions (Dunlap, G., Kern-Dunlap, L., Clarke, S., & Robbins, F.R., 1991; McGill, 1999) have been used to abolish the CMO-R of teacher instructions and demands by:


- Mixing and varying the skills taught (i.e., mixed verbal behavior sessions) (Dunlap, 1984; Dunlap & Dunlap, 1987; Dunlap, Dyer, & Koegel, 1980; Dunlap & Koegel, 1980; McComas, Hoch, Paone, & El-Roy, 2000; Winterling, Dunlap, & O’Neil, 1987)


- Gradually increasing the number of demands (Kennedy, 1994; Pace, Ivanic, & Jefferson, 1994; Pace, Iwata, Cowdery, Andree, & McIntyre, 1993; Piazza, Moses, & Fisher, 1996; Weld & Evans, 1990; Zarcone, Iwata, Smith, Mazaleski, & Lerman, 1994; Zaracne, et al., 1993)

- Gradually increasing the difficulty or effort of responses (Horner & Day, 1991; Iwata, Smith, & Michael, 2000; Richman, Wacker, and Winborn, 2001; Wacker, et al., 1990; Weld & Evans, 1990)

- Immediately reinforcing alternative behaviors (Horner and Day, 1991)

For a review of the literature on the application of the motivating operation to the reduction of problem behavior and discussion of the methods outlined in the section above see Carbone, Morgenstern, Zecchin-Tirri, & Kolberg, 2010; Langthorne, McGill & Oliver, 2014; McGill, 1999; Smith & Iwata, 1997; and Wilder & Carr, 1998.

The following table summarizes these teaching procedures and provide a self-assessment tool that can be used to determine what antecedent curricular revisions you need to make to your current instructional methods in order to more effectively abolish the CMO-R and abate the problem behavior exhibited by your learners.
How To Abolish The CMO-R

- While abolishing the CMO-R appears to be an effective method of reducing problem behavior during instruction, in practical application infrequent use is made of this independent variable.

- Here are several examples of how to apply these antecedent manipulations to abolish the CMO-R, thereby increasing the effectiveness of instruction:
  
  - The first situation is one where all stimuli associated with an instructional environment initially acted as reflexive MOs. Here the CMO-R was abolished through presentation of a strong abolishing operation. Note the difference in learner cooperation.

    Jack in High Chair
    Jack Part 1
    Jack Abolishing the CMO-R # 2

  - This example shows a situation where the teaching environment and teacher instructions and demands acted as reflexive MOs. We will then see the same learner a few weeks later when the teaching procedures were changed to include methods that abolished the reflexive MOs. Note the differences in student and teacher responding.

    Kyle Case Study- Revised July 2013

- Here are videos of a teacher abolishing the CMO-R during a discrete trial training session with uncooperative learners. Take note of how prior to these curricular revisions escape from the instructional situation was the most valuable reinforcer. Following the curricular revisions, however, the learners quickly returns to the instructional environment without problem behavior.

  Brittany
  David R. Abolishing CMO-R Case Study

ACTIVITY
Virtual Consultant
Questions On Next Slide
(Josh and Vince)
Josh Picture

- Finally, here are several different learners of varying skill levels whose instructors are using procedures that reflect manipulation of the variables that abolished the aversive nature of the teaching setting. Note in particular the use of errorless instruction which reduces the frequency of errors, intersperse of high rate of mastered items, the mixing of all the skills being taught (mixed VB), the relatively brisk pace of the instruction, the high rate of reinforcement, etc.

  MVB Videos
Virtual Consultant Questions

Behavioral Interventions
Behav. Intervent. 30: 135–156 (2015)
Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/bin.1408

EFFECTS OF PRESESSION PAIRING ON THE CHALLENGING BEHAVIOR AND ACADEMIC RESPONDING OF CHILDREN WITH AUTISM

Amanda N. Kelly¹,², Judah B. Axe¹,², Ronald F. Allen¹*, and Russell W. Maguire¹
¹Department of Behavior Analysis, Simmons College, Boston, MA, USA
²Department of Education, Simmons College, Boston, MA, USA
³Keiki Educational Consultants, Inc., Honolulu County, HI, USA

Presession pairing is an antecedent-based procedure in which an instructor engages with preferred items with a child for a few minutes before an instructional session. Although this procedure has been described in manualized treatment guidelines for working with children with autism, there are currently no direct investigations of whether this manipulation has a beneficial impact on target responding or the child’s social interactions. Functional analyses with three children with autism showed escape or attention and escape as reinforcers for their challenging behavior. Preference assessments identified highly and moderately preferred stimuli. In the context of a multiple baseline across participants design, the participants exhibited fewer challenging behaviors when instructional sessions were preceded by presession pairing than when they were not. Academic responding showed modest increases. Subsequently, in the presence of presession pairing with a novel task, the participants emitted no challenging behavior and similar or higher levels of academic responding. One participant was available for a maintenance session without presession pairing 5 months later and showed near-zero levels of challenging behavior and comparable levels of accurate academic responding. The implications of the findings and future directions are discussed. Copyright © 2015 John Wiley & Sons, Ltd.
Figure 3. Percentage of 10-s intervals with challenging behaviors in baseline, pre-session pairing, and novel task for Ariel, Jonah, and Suzanna and maintenance for Ariel.

Figure 4. Percentage of accurate academic responding in baseline, pre-session pairing, and novel task for Ariel, Jonah, and Suzanna and maintenance for Ariel.
A second, related explanation is that presession pairing may have altered the instructor (or other stimulus elements of the instructional setting) from a CEO-R (or conditioned aversive stimulus, as described previously) correlated with a worsening condition characterized by a high rate of demands and a low rate of reinforcement to stimuli correlated with the delivery of positive reinforcers (Carbone et al., 2010; Hineline, 1977; McGill, 1999; McLaughlin & Carr, 2005; Michael, 2000). The immediate reduction in challenging behavior seems to support this hypothesis as presession pairing may have momentarily altered the aversiveness of stimuli associated with the instructional setting, a defining characteristic of the motivating operation (Michael, 2007). This explanation could be tested by measuring the effects of pairing with some adults and not others on evoking problem behavior or evaluating the effects of pairing and then ‘unpairing’ the same adult.
Figure 2. Frequency of problem behavior per session by suspected function during fast, medium, and slow teacher presentation rates for David and Sarah.
References


CEO-T: Definition & animal example

CEO-T: An environmental variable related to the relation between another stimulus and some form of rfmt, and thus establishes the reinforcing effectiveness of the other stimulus, evokes all behavior that has produced that stimulus.

Examples: UEOs function as CEO-Ts for stimuli that are S’s because of their relation to the relevant S'.

For example: When deprived of food and food is only available by opening a can, then a can opener will be conditioned as a reinforcer and all behavior that has produced can openers in the past will be evoked.

What is the CEO-T?- Food Deprivation and the context (food is only available from a can and no can opener is available)
In the case of food deprived pigeon, Tone is off- key pecks produce no reinforcement. Treadle press turns on tone so that key pecks now produce food reinforcement for 3 seconds and then back to Tone off state.

**ACTIVITY # 7**

<table>
<thead>
<tr>
<th>Tone off</th>
<th>R1</th>
<th>Tone ON</th>
<th>R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rfmt off</td>
<td></td>
<td>Rfmt off</td>
<td></td>
</tr>
</tbody>
</table>

R1 = treadle press, R2 = key peck, rfmt = 3" grain available

**Human CEO-T: Flashlight example**

The rfing effectiveness of many human S's is dependent on other stimulus conditions because of a learning history. Thus conditioned reinforcing effectiveness is dependent on a context. When the context is not appropriate the S may be available, but is not accessed because it is not effective as rfmt in that context. A change to an appropriate context will evoke behavior that has been followed by that S. The occurrence of the behavior is not related to the availability of the S, but to its value.
Flashlight ACTIVITY

Human CEO-T: A sudden power outage after dark in most homes immediately evokes some action on the part of the dwellers.

Answer these questions
- What is the CEO-T:
- Conditioned reinforcer established by CEO-T:
- Behavior evoked:
- $S^D$ for Behavior:
- Ultimate Reinforcer:
- Explain why the CEO-T you have identified is not an $S_d$ for the behavior (discuss how only the MO and not the $S_d$ conditions are met):

Screwdriver ACTIVITY

Human CEO-T: Slotted Screwdriver Exercise
Consider a workman disassembling a piece of equipment, with an assistant providing tools as they are requested. The workman encounters a slotted screw and requests a screwdriver.

Answer these questions
- What is the CEO-T:
- Conditioned reinforcer established by CEO-T:
- Behavior evoked:
- $S^D$ for Behavior:
- Ultimate Reinforcer:
- Explain why the CEO-T you have identified is not an $S_d$ for the behavior (discuss how only the MO and not the $S_d$ conditions are met):
Danger ACTIVITY

**Human CEO-T: The danger stimulus Exercise**
A night security guard patrolling an area hears a suspicious sound. He activates his mobile phone which signals another guard, who then activates his own phone and asks if help is needed (the rfmt for the first guard’s response). Is the suspicious sound an Sd or CEO-T and why?

Answer these questions

- What is the CEO-T:
- Conditioned reinforcer established by CEO-T:
- Behavior evoked:
- S<sup>0</sup> for Behavior:
- Ultimate Reinforcer:
- Explain why the CEO-T you have identified is not an Sd for the behavior (discuss how only the MO and not the Sd conditions are met):

- The transitive conditioned motivating operation (CMO-T) appears to be most relevant to the conditioning of stimuli as reinforcers (Sundberg, 2005) and may play an important role in teaching language and other skills to children with autism who fail to acquire these repertoires through typical means.

- Michael originally referred to this conditioning effect by another name; blocked access or interrupted chain effect. In other words, if some item is highly valuable at this moment but some additional action, item or even information is necessary to produce the valued item then any of the additional stimuli would now act as reinforcers for any behavior that would produce them.

- In other words, CMO-Ts convert neutral stimuli to conditionally conditioned reinforcers and therefore evoke all responses that have in past been strengthened by their delivery.
**Conditioned Transitive Motivating Operation**

**CMO-T**

- When An Item or Activity or Action Would Act as a Reinforcer
- AND
- Some Other Item or Activity or Action is Required To Obtain the Reinforcer
- AND
- Access to the other item, activity or action is Blocked or Interrupted

Then

- The Other Item, Activity or Action is Momentarily Conditioned as a Reinforcer
- AND
- All Behavior That Has Previously Been Strengthened with That Reinforcer Will be Evoked

---

**CMO-T Example**

**CMO-T**

- When Driving My Car Becomes Valuable to Me
- AND
- I Need My Car Keys
- AND
- I Can’t Find My Keys

Then

- Information About the Location of My Keys is Momentarily Conditioned as a Reinforcer
- AND
- All Behavior That Has Produced Information About Location is Evoked
  "I ask, Where are my keys?"
• Another example, if a child has motivation for cereal, and is given a bowl of cereal without a spoon, the motivation for the cereal “but without a spoon” momentarily alters the value of the spoon as a reinforcer and therefore evokes any behavior that has produced a spoon in the past, such as searching or asking another person.

• The spoon has become a conditioned conditional reinforcer because consuming the cereal is conditional upon obtaining a spoon. Once the spoon is delivered, the child then is able to consume the food which has all along had value but was unobtainable.

• By contriving this type of situation a teacher could condition items or activities in the environment as reinforcers and use these now established reinforcers to teach language disordered persons to mand for them.

• In his book Verbal Behavior Skinner defined the mand as “a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or satiation.” (1957, pp. 33-36).

• Since the mand or request response plays an important role in the language training of persons with autism (Sundberg & Michael, 2001) a teacher’s knowledge of how to make use of the transitive establishing operation as an independent variable may be critical.

• Shafer (1994) points out that the transitive EO can be used to establish the reinforcing potential of many previously neutral items without the disadvantages associated with unconditioned establishing operations.

• Moreover, by using the transitive EO to condition items as reinforcers in a chain of responses, language disordered children can be taught to mand for items primarily under the control of the EO and therefore free their responses from the additional control exerted by the presence of the item.

• Several studies have demonstrated the effectiveness of increasing the mand repertoire of persons with developmental disabilities through the use of the transitive motivating operation. (Albert, Carbone, Murray, Hagerty & Sweeney-Kerwin, 2012; Arntzen & Almas, 2002; Betz et al., 2010; Carroll & Hesse, 1987; Endicott & Higbee, 2007; Hall & Sundberg, 1987; Lechago et al., 2010; Marion, Martin, Yu, & Buhler, 2011; Marion, Martin, Yu, Buhler, & Kerr, in press; Marion, Martin, Yu, Buhler, Kerr & Claets, 2012; Rosales & Rehfeldt, 2007; Roy-Wsiaki, Marion, Martin, & Yu, 2010; Shillingsburg & Valentino, 2011; Sidener et al., 2010; Sigafoos, Doss, & Reichle, 1989; Sundberg et al., 2002; Williams et al., 2000; Ziomek & Rehfeldt, 2008).
• Hall and Sundberg (1987) were among the first experimenters to successfully demonstrate the value of using an interrupted chain (CMO-T) to teach persons with developmental disabilities to mand for missing items necessary to complete chains related to making coffee, soup and purchasing items from vending machines.

• Blocking items necessary to complete the chains of making coffee and soup allowed the experimenters to contrive motivation for items which were previously motivationally neutral, where obtaining the missing items served as a conditioned reinforcer since it led to consumption of the terminal reinforcer, the coffee and the soup.

• By contriving the CMO-T in a procedure such as this, it ensures that the MO is in effect at the time of training and eliminates control exerted by discriminative stimuli.

• This study demonstrated that mands for missing items could be taught by manipulating the CMO-T.

• Since the findings of Hall and Sundberg (1987), experimenters have extended the use of the interrupted chain procedure to teach persons with developmental disabilities to mand for missing items.

• In the next page is a diagram describing the application of the CMO-T within language training programs for children with autism.
• In a recent study by Albert, Carbone, Murray, Sweeney-Kerwin (2012) that replicated and extended Hall and Sundberg (1997) three children with autism were taught to mand for missing items by contriving the CMO-T in the context of an interrupted chain.
Increasing the Mand Repertoire of Children With Autism
Through the Use of an Interrupted Chain Procedure
Kristin M. Albert, Vincent J. Carbone, Danielle D. Murray, Margaret Hagerty, and Emily I. Sweeney-Kerwin
Carbone Clinic

ABSTRACT
Mand training is an essential component of verbal behavior training for any individual who lacks this skill. The current study replicates and extends, with some procedural differences, the work of Hall and Sundberg (1987) by using an interrupted chain procedure to teach mands for missing items to children with autism. The participants were 3 children with autism, ranging in age from 5 to 8 years of age, who would regularly mand for a wide variety of reinforcers if they were present but would not mand for items that were not in sight (i.e., missing items). Participants were first taught to complete 3 behavior chains. Subsequently, the chains were interrupted by removing 1 item needed to complete each chain to contrive motivating operations (MOs) as a means of teaching mands for missing items. Following mand training incorporating vocal prompt and prompt fading procedures, all participants emitted unprompted mands for the missing items within the context of the trained chains and within the context of novel, untrained chains. After teaching mands for missing items, probes were conducted to test for untrained tact acquisition. All participants also demonstrated tact responses relative to the missing items as a result of the mand training.
Keywords: autism, establishing operation, interrupted chain, mand, motivating operation

Table 1: Descriptions of Chains Taught to Participants

<table>
<thead>
<tr>
<th>Participant and Chain</th>
<th>Materials</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victor</td>
<td>1. Shapes cut from paper, Glue, Glitter</td>
<td>Pick up paper shapes, Put glue on each shape, Arrange shapes into a picture, Put glue on top of arranged shapes, Sprinkle glitter on top of glue</td>
</tr>
<tr>
<td>2. Painting a picture</td>
<td>Snack, Paper, Chip, Paintbrush, Water, Paint, Easel</td>
<td>Put on snack. Hand dip to instructor (no chip paper onto card), Pick up paintbrush, Dip paintbrush in water, Dip paintbrush in paint, Apply paintbrush to paper, Repeat painting steps several times</td>
</tr>
<tr>
<td>3. Making a sandwich</td>
<td>Bread, Toaster, Ploy, Peanut butter, Knife</td>
<td>Open bag of bread, Put toasted in toaster, Push down toaster button, Take bread out of toaster, Put bread on plate, Open peanut butter, Put peanut butter on knife, Spread peanut butter on bread, Eat sandwich</td>
</tr>
<tr>
<td>Nathaniel</td>
<td>Portable CD player, CD, Headphones</td>
<td>Open CD player, Put CD in CD player, Put headphones on, Press play button, Listen to music</td>
</tr>
<tr>
<td>1. Science project</td>
<td>Plastic container, Bottle of water, Two bottles of food coloring, Spoon</td>
<td>Pour water into container, Drop food coloring into container, Pick up spoon, Mix liquid with spoon</td>
</tr>
<tr>
<td>2. Painting a picture</td>
<td>Snack, Paper, Paintbrush, Water, Paint, Easel</td>
<td>Put on snack, Put paper on card, Pick up paintbrush, Dip paintbrush in water, Dip paintbrush in paint, Apply paintbrush to paper, Repeat painting steps several times</td>
</tr>
<tr>
<td>3. Carina</td>
<td>Painting a picture</td>
<td>Snack, Paper, Chip, Paintbrush, Water, Paint, Easel</td>
</tr>
<tr>
<td>4. Making an art project</td>
<td>Paper, Glue stick, Glitter</td>
<td>Color picture, Rub glue on paper, Sprinkle glitter on top of glue</td>
</tr>
<tr>
<td>5. Making juice</td>
<td>Cup, Powder to make juice, Spoon, two ice cubes, Measuring cups containing water</td>
<td>Scoop powder into cup, Pour water from measuring cups into cup, Mix solution in cup with spoon, Put ice cubes into cup, Drink juice</td>
</tr>
</tbody>
</table>

Note: Materials removed to reach mands for missing items are shown in boldface.
The response chains for Vincent included:

- **Painting a picture** - Objects included a smock, paper, clip, paintbrush, water, paint and an easel. The actions consisted of putting on the smock, handing the clip to the instructor, picking up the paintbrush, putting the paintbrush in the water, putting the paintbrush in the paint and applying the paintbrush to the paper and then repeating some of these actions several times during the activity.

- **Making an art project** - Objects included paper cut into shapes, glue and glitter. The actions consisted of picking up the paper shapes, putting glue on each shape, arranging the shapes into a picture, putting glue on the arranged shapes and sprinkling glitter onto the shapes.

- **Making a sandwich** - Objects in this response chain included bread, a toaster, a plate, peanut butter and a knife. The actions consisted of opening the bag of bread, putting the bread into the toaster, pushing the toaster down, taking the bread out of the toaster, putting the bread on the plate, opening the peanut butter, putting the peanut butter on the knife, spreading the peanut butter on the bread and eating the sandwich.

The response chains for Naryan included:

- **Listening to music** - Objects included a portable CD player, a CD, and headphones. The actions consisted of opening the CD player, putting the CD in the CD player, putting the headphones on, and pressing the play button.

- **Science project** - Objects included a plastic container, bottle of water, 2 bottles of food coloring, and a spoon. The actions consisted of pouring the water into the container, dropping the food coloring into the container, picking up the spoon, mixing the liquid with a spoon.

- **Painting a picture** - Objects included a smock, paper, paintbrush, paint, water, paint and an easel. The actions consisted of putting on the smock, picking up the piece of paper, picking up the paintbrush, dipping the paintbrush in the water, putting the paintbrush in the paint and applying the paintbrush to the paper and then repeating some of these actions several times during the activity.
The response chains for Cadia included:

- **Making juice** - Objects included a cup, powder to make juice, spoon, 2 ice cubes and a measuring cup. The actions consisted of scooping powder into cup, pouring water in the cup, and putting the ice cubes into the cup.

- **Making an art project** - Objects included paper, 3 crayons, glue stick, and glitter. The actions consisted of coloring the picture, rubbing the glue on the paper, and sprinkling glitter on the paper.

- **Painting a picture** - Objects included a smock, paper, clip, paintbrush, water, paint and an easel. The actions consisted of putting on the smock, picking up the piece of paper, handing the clip to the instructor, picking up the paintbrush, dipping the paintbrush in the water, putting the paintbrush in the paint and applying the paintbrush to the paper and then repeating some of these actions several times during the activity.

---

![Figure 1](image-url)  
*Figure 1. The occurrence of mands for missing items recorded by controlling variable (MO, prompted, no response) across baseline and treatment conditions.*
Figure 2. The occurrence of mands for missing items recorded by controlling variable (MO, prompted, no response) across baseline and treatment conditions.

EO = EO Controlled
P = Vocally Prompted
NR = No Response

Figure 3. The occurrence of mands for missing items recorded by controlling variable (MO, prompted, no response) across baseline and treatment conditions.
### CMO-T Lesson Plan for Increasing MandS: Teaching

**Learner:** Andrew

**Date:**

**Activity:** Drawing a Picture

**Description of the Routine/Chain:** Andrew has motivation for seeing a completed drawing of a train. He needs certain features of the train to be drawn and certain colors used.

**Objective:** To increase opportunities to teach wider variety of mandS by momentarily conditioning actions (drawing parts of the train) as reinforcers (by withholding drawing features of the train), as they are necessary to access the terminal reinforcer of seeing the completed drawing (i.e., contriving the CMO-T).

<table>
<thead>
<tr>
<th>Set up to Contrive MO</th>
<th>What is conditionally conditioned as a reinforcer?</th>
<th>What should you teach the learner to say?</th>
<th>Probe Data Recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor draws the train track in order to contrive motivation. Andrew now has the motivation to complete the train drawing. The trains are missing from the drawing.</td>
<td>The teacher drawing a train</td>
<td>Draw blue train</td>
<td>Y N</td>
</tr>
<tr>
<td>Draws the outline of the blue train. Coloring in the blue train.</td>
<td>Coloring in the blue train</td>
<td>Color blue</td>
<td>Y N</td>
</tr>
<tr>
<td>Train colored in blue, but missing features of the train (smokestack)</td>
<td>Drawing the smokestack</td>
<td>Smokestack</td>
<td>Y N</td>
</tr>
<tr>
<td>Smokestack not colored in.</td>
<td>Coloring in the smokestack</td>
<td>Color blue</td>
<td>Y N</td>
</tr>
</tbody>
</table>

**Andrew: Drawing a Picture**

---

### CMO-T Lesson Plan for Increasing MandS: Teaching

**Learner:** andre

**Date:**

**Activity:** Customize

**Description of the Routine/Chain:** Andre often accompanies his requests to the computer to watch flashcards on YouTube.com. To watch them, he must use the mouse to click the search box to type in the name of the show he wants to see. When he types in the search box, the search results will appear on the screen, and he can click on the show to watch it.

**Objective:** Increase opportunities to teach a wider variety of mandS by rewarding the learner for using the mouse to select a show and turn up the volume on the speakers so he can hear the music.

<table>
<thead>
<tr>
<th>Set up to Contrive MO</th>
<th>What is conditionally conditioned as a reinforcer?</th>
<th>What should you teach the learner to say?</th>
<th>Probe Data Recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andre has an MO to watch flashcards on YouTube.com. He points in the search box and types in the name of the show.</td>
<td>Mouse</td>
<td>&quot;Mouse&quot;</td>
<td>Y N</td>
</tr>
<tr>
<td>Andre has an MO to watch flashcards on YouTube.com. After using the mouse to click the search box to type in the show's name, the instructor will say &quot;Get the searching right.&quot;</td>
<td>Keyboard</td>
<td>&quot;Keyboard&quot;</td>
<td>Y N</td>
</tr>
<tr>
<td>Andre has an MO to listen to music on YouTube.com.</td>
<td>Speakers</td>
<td>&quot;Speakers&quot;</td>
<td>Y N</td>
</tr>
</tbody>
</table>

**Andre Manding**

---

*Developed by the Staff of the Centre for Inclusive Learning. May be copied and redistributed with proper attribution.*
Manding for Information

• Similar studies have been conducted to condition verbal information as a reinforcer by using the CMO-T as an independent variable in increasing the mand repertoire in children with autism (Williams, Donely, & Keller, 2000; Sundberg, Loeb, Hale, & Eigenheer 2002; Endicott & Higbee 2007).

• Sundberg, Loeb, Hale, and Eigenheer (2002) contrived CMO-T to teach mands for information to two children with autism.

• The first portion of the experiment involved giving the participants desired and undesired items in a container.

• After being taught to obtain a variety of reinforcers from the containers, the participants were later given the same containers without the reinforcing items inside.

• This procedure resulted in conditioning the missing items as reinforcers so that their absence would evoke responses that might produce the missing items, e.g., searching or information.

• To teach a mand for information instead of searching behavior the therapist immediately prompt the response “where” and reinforces with information that leads to obtaining the desirable items.

• Once the “where” response was occurring reliably a second experiment was conducted to teach the response “who”.

• The second experiment involved contriving another MO by informing the participants that the item was given to a teacher, increasing the value of obtaining information about the teacher’s name, asking “who” as a reinforcer.
Manding For Information Teaching Procedures

- Skinner (1957) states, “A question is a mand which specifies verbal action.”

- In other words, there are stimulus conditions under which a verbal response (information) has been established as a reinforcer and therefore evokes a question (mand), the answer (verbal action) to which in the past has produced some form of reinforcement (e.g. more effective action by the asker).

- For example, if my hat becomes valuable as a piece of warm clothing (S-1) AND I discover that it is not to be found in its usual place (S-2), then information about its location will be established as a reinforcer and may therefore evoke the response “where is my hat?” since that response has previously produced information that directed me to my hat when it had reinforcing value.

- Sundberg, et al. (2002) demonstrated that mands for information regarding location (where) and specific information about a person (who) could be taught to children with autism by manipulating transitive establishing operations (CMO-T).

General Teaching Procedures:

- Contrive motivation for information (e.g., hide an item that the learner needs, interrupt a pre-established routine).

- As soon as the learner declares motivation for “who,” “what,” “which,” “where,” “why,” “how,” or “can/does/do/will” information (e.g., looks for the missing item), prompt the mand by saying, “Ask me, ‘mand for information?’” (e.g., “Ask me, ‘Where is the pencil?’”)

- Immediately following the learner echoing the prompted mand, transfer stimulus control by recontriving motivation and implementing a 3-second time delay to wait for the learner to repeat the mand for information.

- After the learner repeats the mand for information, reinforce the mand by delivering the INFORMATION requested.
Teach the following:

**What:** when the names of people, places, things, and actions would be reinforcing information

**Where:** when location would be reinforcing information

**Who:** when the name of a specific person would be reinforcing

**Whose:** when the name of a person who possesses something would be reinforcing

**When:** when information regarding time would be reinforcing

**Why:** when information for the causes of events would be reinforcing

**How:** when information for instructions and the functions of things would be reinforcing

Adapted from Sundberg (2002)

• Let’s now look at a video example of manding for information. Notice how the instructor must prompt some forms of the appropriate mands for information (questions) when the MO is strong but when the learner does not have the form of the response in his repertoire.

• As you watch the video, follow along with the diagram below which specifies the controlling nature of each stimulus in the chain of responses.
Chain Of Mands For Information
Diego Video

**Manding Why?**
(S-1) Watching the video is effective as reinforcement.
(S-2) Kim says to Diego, “Press stop.”

ESTABLISHES
An explanation of her request as a reinforcer.

EVOSES
Diego to say, “WHY?”
Reinforcer: Kim says, “Because we are going to go play with some toys.”

Manding Where?
(S-3) “Because we are going to play with some toys.”

ESTABLISHES
Additional information about the location of the toys as a reinforcer.

EVOSES
Diego to say, “WHERE?”
Reinforcer: Kim says, “Over at the other table.”

**Manding How?**
(S-4) Placing parts on Mr. Potato Head is effective as reinforcement.
(S-5) Diego tries, but can not put the backpack on Mr. Potato Head.

ESTABLISHES
Instructions about how to do it as a reinforcer.

EVOSES
Diego to say with an echoic prompt, “HOW DO I DO IT?”
Reinforcer: Kim tells him how to do it.

Manding Where?
(S-6) The nose on Mr. Potato Head is effective as reinforcement.
(S-7) Diego cannot find it.

ESTABLISHES
Information about its location as a reinforcer.

EVOSES
Diego to say, “WHERE IS IT?”
Reinforcer: Kim says, “On the shelf.”
Manding Which?
(S-8) Kim says “On the shelf.”
(S-9) There are several shelves.

ESTABLISHES
Information regarding a specific shelf as a reinforcer.

EVOKEs
Diego to say, “WHICH ONE?”
Reinforcer: Kim says, “The one over there.”

Manding Where?
(S-10) Mr. Potato Head eyes are effective as reinforcement.
(S-11) Diego cannot find them.

ESTABLISHES
Information about the location of the eyes as a reinforcer.

EVOKEs
Diego to say, “WHERE ARE THE EYES?”
Reinforcer: Kim says, “I don’t know but I know someone who does.”

Manding Who?
(S-12) Kim’s information about someone who knows.

ESTABLISHES
Information about a specific person as a reinforcer.

EVOKEs
Diego to say with an echoic prompt, “Who?”
Reinforcer: Kim says, “Emily.”

DIEGO VIDEO
In this second video, Tyler’s repertoire of manding for information is now quite strong and therefore requires no prompting. The appropriately contrived MOs evoke all of the mands.

Let’s watch this video of Tyler and note how Jimmy contrives the motivation that increases the value of information as a reinforcer for Tyler.

TYLER VIDEO

Kellen Manding Information

---

Sample Lesson Plan

<table>
<thead>
<tr>
<th>Contrived MO (MOTIVATION)</th>
<th>What Now Becomes a Reinforcer?</th>
<th>What should you teach the learner to say?</th>
<th>Teacher’s Response (Reinforcer)</th>
<th>Data Recording of Prompted and Unprompted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guess what?</td>
<td>Info about what they are going to do</td>
<td>What?</td>
<td>I want to play with something...</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>I want to play with something...</td>
<td>Info about what Jimmy wants to play with</td>
<td>What do you want to play with?</td>
<td>I want to play with the trains</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>(Goes to the trains) Not right now though...</td>
<td>Info about when Tyler can play with the trains</td>
<td>When?</td>
<td>After you give me a high five</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>We’ve got to turn it on...</td>
<td>Info about how to turn it on</td>
<td>How do we turn it on?</td>
<td>We have to press that button</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>(Button doesn’t work) I don’t know how to turn it on, but I know someone who does</td>
<td>Info about who knows how to turn on the trains</td>
<td>Who?</td>
<td>(Knows how to turn on train)</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>Danielle knows how to turn it on</td>
<td>Info from Danielle about how to turn on the trains</td>
<td>How do we turn it on?</td>
<td>You press the lever</td>
<td>Prompted Spontaneous Novel</td>
</tr>
</tbody>
</table>
### Sample Lesson Plan

#### TYLER

<table>
<thead>
<tr>
<th>Contrived MO (MOTIVATION)</th>
<th>What Now Becomes a Reinforcer?</th>
<th>What should you teach the learner to say?</th>
<th>Teacher’s Response (Reinforcer)</th>
<th>Data Recording of Prompted and Unprompted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidentally turn the train off</td>
<td>Info about why Jimmy turned the train off</td>
<td>Why did you do that?</td>
<td>It was an accident, but I want to play another game</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>I want to play another game...</td>
<td>Info about what game the teacher wants to play</td>
<td>What game?</td>
<td>Perfection</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>Lets go get Perfection</td>
<td>Info about where Perfection is</td>
<td>Where’s Perfection?</td>
<td>I don’t know where it is, but I know someone who knows</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>I know someone who knows where Perfection is</td>
<td>Info about who knows where Perfection is</td>
<td>Who? (Knows where Perfection is)</td>
<td>Kelly</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>Kelly knows where Perfection is</td>
<td>Info about where Perfection is</td>
<td>Where’s Perfection?</td>
<td>In the teacher’s room</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>The closet is locked and the key is missing</td>
<td>Info about where the key is</td>
<td>Where’s the key?</td>
<td>I don’t know where it is, but I know someone who knows</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>I know someone who knows where the key is...</td>
<td>Info about who knows where the key is</td>
<td>Who?</td>
<td>Danielle</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>Danielle knows where the key is</td>
<td>Info about where the key is</td>
<td>Where’s the key?</td>
<td>It is on top of the bookshelf</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>You need to open the door with one of the keys</td>
<td>Info about which key he should use</td>
<td>Which key?</td>
<td>This key</td>
<td>Prompted Spontaneous Novel</td>
</tr>
<tr>
<td>We’re not going to play the game here</td>
<td>Info about where to play the game?</td>
<td>Where are we going to play?</td>
<td>At the table</td>
<td>Prompted Spontaneous Novel</td>
</tr>
</tbody>
</table>
Examples of How To Contrive MO For Manding For Information Manding

Manding “What”

The teacher will bring in a paper bag with things the child likes inside the bag (i.e. little toys, gummies, books).
The teacher will look inside the bag and say “Wow, look at this!” while keeping the bag closed.
Prompt the child to say “What is it?” or “What is in there?”
Teacher says it is a book and removes the item from the bag and delivers the book to the child.

Teacher presents a field of three or more cards and objects both mastered and target items.
Present ST, “Tell me what is on the table.”
Prompt “What is it?” when the child comes to the unknown item.
Teacher will tact item and give reinforcement.

Teacher says, “I have a surprise for you.”
Prompt, “What?,” “What is it?,” or “What do you have?”
Tell the child what it is you have and deliver the item.

Teacher says, “I want to play.”
Prompt, “What do you want to play?”
Teacher says, “(Name of reinforcing game or toy).”

Manding “Where”

Present the child with a closed box that has a reinforcer (candy works best) in it and say, “This is for you.”
Present the box two times with the reinforcer in it. On the third time, the box will be empty.
Prompt, “Where?,” or “Where is my candy?”
Say, “Oh, I forgot, it’s in the pantry”

While doing an activity, the teacher will abruptly end the activity with no warning and say, “come on.”
The teacher should prompt, “Where are we going?” The teacher will then say, “To play on the computer (or name any reinforcing item or activity that is more reinforcing than the item they are leaving).”

The teacher should say, “Get the,” or “Give me the,” requiring the child to find an item necessary for a reinforcing task (e.g. “Go get your shoes so we can go outside”).
The necessary item will not be available or missing from its normal place.
Prompt the child to say, “Where are my shoes?”
The teacher should then give the location of the shoes.
Manding “Where” continued

Have the child come to sit, but have no chair for him/her.
Prompt, “Where is my chair?”

Have the child sitting and suddenly get up and say, “I will be right back.”
Prompt, “Where are you going?”
Teacher should say, “To get a gummy (or other reinforcing item) for you.”

Teacher will deliver lunch with no utensils.
Prompt, “Where is my spoon?” or “Where is my fork?”

Teacher will present crafts with one necessary item missing (i.e. glue) and say, “Okay, put some glue on it.”
Prompt, “Where is the glue?”

Have the child come to the table for a preferred activity (e.g. Legos) but have only one piece on the table.
Prompt, “Where are the rest?”

Manding “Why”

Teacher will put a chair on the table while the child is engaging in another activity. Then tell the child, “Go sit down.”
When the child returns to the table, the teacher should prompt, “Why is the chair there?”
Teacher can answer with something like, “I was cleaning the floor and look what I found under your chair” while handing the child a reinforcer.

Teacher says, “I am going outside to play.”
Prompt, “Why can’t I go?”
Teacher should say, “You can, follow me!”

At meal time, the teacher should put a NON food item on the child’s plate and give the plate to the child.
Prompt the child to say, “Why did you do that?”
Teacher should act as if they got mixed up and present the child with the correct plate.

The child is doing a reinforcing activity (e.g. watching television) and the teacher turns it off with no warning.
Prompt, “Why did you do that?” or “Why did you turn it off?”
Teacher should say, “So we can go to the playground.” (Remember the teacher must pick an activity that is MORE reinforcing to the child than what he/she was just doing)
Manding “How”

Teacher will have a see-through jar of desired items and the child will mand for the items. After manding, the teacher should acknowledge the mand by saying, “Oh, sure you can have it.” At the same time, hand the tightly closed jar to the child. The teacher will prompt, “How do I open the jar?” or “How do I open it?” The teacher will show the child how to open the jar.

Teacher will say, “Let’s go outside and play” and take the child to a locked door and say, “Okay, open the door, let’s go.” The teacher will prompt “How do I open the door?” when they see the child seems puzzled as to how to open the door. Teacher will say, “Oh, like this.” while using a key.

Teacher will present the child with a task (e.g. Legos, train set, blocks) and say, “Let’s make a bulldozer.” Prompt, “How do I build a bulldozer?” or “How do I build that?” Teacher will respond, “Oh, here, let me show you.” Remember to choose an activity that cannot be done by the child and an activity the child would want to participate in the completion of.

Play with a toy that the child cannot operate by themselves. Make the toy do something such as play music or make a noise. Prompt the child to ask, “How did you do that?”

Manding “Which”

Teacher will set up a situation where two similar reinforcers are on the table and say, “Give me a gummy (one is red and one is blue).” Prompt, “Which one?” Teacher says, “The red one.” The child should hand the red one to the teacher and the teacher should give the other item to the child.

Teacher should put a reinforcer in their hand and switch it back and forth, hiding the location. With hands extended out, prompt, “Which hand?” Say, “This one” and deliver the reinforcer from hand to the child.

Teacher will put out three containers that are the same and move them around with a reinforcing item under them. Tell the child, “You can have the cookie.” Prompt the child to ask, “Which one is it under?”

Teacher should offer the child two cookies and say, “You can only have one.” Prompt, “Which one can I have?”
Manding “Who”

Have three people in the room and say, “Someone has a gummy for you.” Prompt, “Who?” or “Who does?” Give the name of the person and the child walks to the person and gets the reinforcer.

Teacher presents pictures of known people (e.g. mom, dad, grandparents) and unknown professionals. The teacher holds up one picture and says, “Who is it?” Only ask one time when starting the game. When an unknown person is held up, prompt, “Who is that?” and tell the child who it is.

Using toys that are reinforcing to the child, the teacher will hide a toy character behind a barrier and say, “Guess who is behind here?” Prompt, “Who?” Show the item and name the item and let the child have it.

Manding “When”

Place a highly desired item on the table and when the child mands for it, the teacher should say, “Not right now.” Prompt, “When can I have it?” or “When is it my turn?”

The teacher should say, “After (name person) is done with it.” Prompt peer to put it down (reinforce peer for doing so) and teacher tells child, “Now you can have it.”
Extensions of the CMO-T Research

- The CMO-T has recently been implicated in the teaching of eye gaze and social referencing (Holth, 2005) and joint attention (Dube, MacDonald, Mansfield, Holcomb & Ahearn, 2004; Holth, 2005; Taylor and Hoch, 2008;)

- The term does not appear directly in any of these studies however the descriptions of how social stimuli are conditioned as reinforcers clearly suggests that the manipulation of a CMO-T was the effective independent variable.

- For example, Dube et al. (2004) suggested that the sight of an “interesting event” that is not simultaneously seen by a nearby adult will alter the value of the adult’s attention as a reinforcer and evoke all behavior that has produced that form of reinforcement in the past.

- The example they provide is related to a cat suddenly appearing in a location where that would be unexpected.

- Taylor and Hoch (2008) make use of a similar analysis in their research designed to teach joint attending skills to children with autism.

- Dube et al. (2004) conclude that failure to acknowledge the role of the CMO-T when teaching joint attention to children with autism may ultimately lead to the undesirable outcome of teaching “imitations of meaningful behavior” (p.216).

- The importance of the CMO-T as a behavioral variable may well extend beyond mand training.

- It appears that the CMO-T may play an important role in teaching social skills and language pragmatic skills to persons who do not acquire these skills typically.
Conditioning Social Attention as a Reinforcer

- Autism is a disorder of impairment of social reciprocity.

- Social deficits have been identified as the core underlying feature of autism spectrum disorder (White, Koenig & Scahill, 2007).

- In fact the deficit does not appear to improve over time and may even worsen as the demands for more complex social interactions increase with age (Carter, Davis, Klin & Volkmar, 2005).

- Of particular concern early in social development is the failure to develop joint attention skills (Isaksen & Holth, 2009).

- “Joint attention has been described as two persons actively sharing attention to an object or an event, while they are monitoring each other’s attention to that object or the event.” (Isaksen & Holth, 2009, p.216).

- Failure to develop this important repertoire has been associated with overall problems with social relatedness including weak language and general social functioning later in life. (Baron-Cohen, 1995, Mundy, 1995).

Conditioning Social Attention as Reinforcer

- Typically developing children ultimately learn to respond to bids from others for joint attention or initiate joint attention responses without explicit training.

- Responding to joint attention seems to develop more quickly in some children with autism since the reinforcer for this response is usually not social.

- In other words, responding to someone’s point, eye gaze or gesture and comment to look at something frequently results in the sight of something reinforcing.

- On the other hand, initiation of bids for joint attention require a different analysis.
• A bid for joint attention is reinforced by the reaction or response of another person suggesting the reinforcing value of the social attention the bid produces. (Dube, MacDonald, Mansfield, Holcomb & Ahearn, 2004; Holth, 2005; Isaksen & Holth, 2009).

• Using Dube et al’s analysis here is what may happen to evoke initiations of joint attention.

• First, it is not just eye contact as depicted below.

---

1. In a Child Who Has Learned the Value of Adult Attention

2. Unexpected Appearance of a Cat is Motivating Operation

   Conditions the Sight of Adult Attending to the CAT & Their Reaction as a Reinforcer

   **EVOKE**
   - Gaze Shift and Point and Vocalizations
   - "Hey, Look at That Cat"

3. Adult Attention to Cat is a Reinforcer for JA Bid

   **AND** Also an S\textsuperscript{D}

   **FOR** Additional Child Play Responses

   That are Reinforced by the Adult’s Continued Attention and Interactions

---

**Kellen Video**
• All of this is dependent upon having a history in which an adult’s or another child's interactions improves most activities.

• Social attention must first be conditioned as a reinforcer before initiations for joint attention will occur.

• Several studies that have attempted to teach joint attention using behavior analytic methods but have failed to condition social attention as a reinforcer. (For review see Isaksen & Holth, 2009).

• Instead, it appears that some have taught “imitations of meaningful behavior” (Dube et al., 2005, p.205).

• Lets look at the behavioral variables and methods of conditioning social attention as a reinforcer.

Teaching Eye Contact as A Social/Language Pragmatic Skill

• Failure to develop eye contact in the early years may ultimately affect the development of language and social behaviors later in life. (Guralnick, Connor, Hammond, Gottman, & Kinnish, 1996).

• Lack of eye contact in children with autism may also affect how others react to the child.

• For example, low rates of eye contact has led to the conclusions that children with autism are aloof, abnormal, impersonal or detached (Hutt & Ounstead, 1966).
• Despite the importance of this issue a limited number of behavior analytic studies have addressed this important issue.

• Until the 1980s, the predominant concern with eye gaze behavior regarded its role as a supposed prerequisite to intensive instruction of other skills (Foxx, 1977; Lovaas, 1977; Lovaas, 1981; Helgeson, Fantuzzo, Smith, & Barr, 1989). The argument was that a child who did not orient toward an instructor would be unable to learn and respond. (Foxx, 1977; Lovaas, 1977; Lovaas, 1981; Helgeson, Fantuzzo, Smith, & Barr, 1989)

• In one variation, Foxx (1977) introduced an experimental condition that combined the use of reinforcement and punishment in the form of an overcorrection procedure; if a child did not perform the target behavior, an unspecified period would follow during which the child was prompted through a random rotation of any of three head positions each of which he maintained for 15 sec.

• In another variation (Helgeson et al., 1989), children were prompted to maintain eye contact as they responded to a series of questions. In some reports the authors also prompted the eye contact responses by holding a reinforcing item at eye level (Greer & Ross, 2007; Hwang & Hughes, 1995). Other prompting procedures included physically guiding the child’s head to look at the researcher. (Greer & Ross, 2007; Hegelson, Fantuzzo, Smith & Barr, 1989).

• While each of these interventions reported increases in eye contact, neither generalization to novel therapists nor generalization to novel settings was achieved, though Lovaas (1981) did stress the importance of programming for generalization.

• Despite the capacity of behavioral interventions to increase eye contact, there has been increasing concern regarding the functionality of such interventions. (Seibert, & Oller, 1981; Mirenda et al., 1983; Rollins, 1999; Arnold, Semple, Beale, & Fletcher-Flinn, 2000; Turkstra, 2005)

• Although some studies employed behavior analytic principles to increase the eye contact of autistic children, each neglected to present a behavioral analysis of eye contact to guide their methods to teach this important social and language pragmatic behavior.

• In a paper by Carbone, O’Brien, Sweeney-Kerwin and Albert (2013) an analysis of how to condition social attention as a reinforcer for eye contact as a language pragmatic skills was offered followed by case study data suggesting the value of the approach.
Teaching Eye Contact to Children with Autism: A Conceptual Analysis and Single Case Study

Vincent J. Carbone
Leigh O'Brien
Emily J. Sweeney-Kerwin
Kristin M. Albert
Carbone Clinic

Abstract

Eye contact occurs very early in development and serves many functions for the young child. It has been implicated in the development of social, cognitive, and language skills. A substantial number of children with autism fail to develop this important skill and therefore experimenters with both developmental and behavior analytic perspectives have researched methods to teach eye contact. However, only a few researchers have recently attempted to condition the response of the communication partner as a reinforcer for social behavior and thereby arrange the conditions under which typical children develop social responses. The purpose of this case study was to extend the analysis of typical development of social skills to the teaching of eye contact as a language pragmatic skill to a child with autism. Data from a single case study of a child with autism are provided.

Keywords: Eye Contact, Social Skills, Mands, Extinction, Autism, Motivating Operations

Behavioral Analysis of Eye Contact During Language Training

Following frequent exposure to the variables that control the mand response the following behavioral chain occurs:

- **Conditioned Transitive Motivating Operation**
- **Child Wants Something – Needs Someone Else to Deliver it**
- **Sight of a Listener’s Face and Eyes**
- **Reinforcer for the Looking Response**
- **S^0 for the Mand**

**Child Mands**

**Delivery of the Item Acts as Reinforcer For Mand**

**Mand Response is Evoked**

**Conditions the Sight of the Face and Eyes of a Listener as a Reinforcer**

**Evolves Looking for Face and Eyes of a Listener**

**Jack Eye Contact Video**

*Italicized Words = Stimuli*

*Bold Words = Behavioral Variables*

*Standard Print Words = Effects of Behavioral Variables*
The CMO-T and Teaching Social Skills

- Sophisticated social skills in children are acquired and maintained when attention and reactions of adults and other children act as reinforcers. (Dube et al. 2004; Isaksen & Holth, 2009)

- This repertoire does not develop easily and without instruction for some children with autism.

- Failure to come easily under the control of social reactions of others may be the greatest barrier to social development in children with autism.

- The behavioral literature suggests that pairing or correlating neutral stimuli (social attention) with established reinforcers may result in the neutral stimuli becoming conditioned or secondary reinforcers. (Copper, Heron & Heward, 2007)

- Isaksen & Holth (2009) suggests that pairing social attention of adults and other children may not be sufficient and he relies on the early work of Lovaas (1966) and early stimulus control research as support for his conclusions.
• They suggest that it is necessary to also condition the neutral stimulus as a
  discriminative stimulus ($S^D$) for a response that ultimately results in acquiring a
  reinforcer.

• In other words, to condition social attention as a reinforcer it will be necessary to
  first condition attention as a discriminative stimulus that is positively correlated
  with the availability of reinforcement for some response ($S^D$).

• Early social development usually includes a progression from wanting others to
  interact, to attending to what other people do, and imitating what they do.
  (Sundberg, 2008)

• By about 18 months children begin manding from others during play and then at
  about 24-30 months children mand for others to join them in play.

• This behavior is of course predicated on the notion that the social attention of
  other children are now conditioned as a reinforcer.

• This generally occurs without explicit programming by parents or teachers.

• If this type of social development does not occur then specific arrangements
  of contingencies may result in the conditioning of other children’s attention
  as reinforcers and therefore increased age appropriate social responding.

  **Peer Manding**

• On the following slide is a behavioral analysis of the social response of
  manding for others to join in play activities.

• Note the central role of the CMO-T in developing this important skill.
Behavioral Analysis of Early Social Skills Training

**ACTIVITY # 12**

Following frequent exposure to the variables that control the response the following behavioral chain occurs:

1. **Sylvia Wants to Bounce.**
2. **Meghan Improves Bouncing**
3. **Meghan Not on Trampoline**
   - **Conditioned Transitive Motivating Operation**

**Conditions the Sight of Meghan as a Reinforcer**

- **Evokes Looking For Meghan**
- **Mand Response is Evoked**

**Sylvia Mands**

- **The approach and Jumping on the Trampoline**
- **Acts as Reinforcer For Mand**

**Sight of Meghan is a Reinforcer for the Looking Response**

\[ + 3 \text{ S}^0 \text{ for the Mand to Join Her on the Trampoline} \]

**Behavioral Analysis of Early Social Skills Training**

**REFERENCES**


