

The Transitive Conditioned Motivating Operation (CMO-T) and Teaching Complex Language and Social Skills to Children with Autism

Vincent J. Carbone, Ed.D., BCBA-D
Carbone Clinic
New York
www.CarboneClinic.com

International Congress on
*Applied Behavior Analysis in the
Treatment of Autism*

Salerno, Italy
March 22-23, 2014

The Transitive Conditioned Motivating Operation (CMO-T) and Teaching Complex Language and Social Skills to 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.

3

- Keller and Schoenfeld gave a name to a newly discovered behavioral variable, “The establishing operation 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.

4

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.”

5

- Michael (1993) identified and for the first time clearly described three (3) different types of CEOs or CMOs. He named them the surrogate, the reflexive and the transitive.

- 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, Sincerski, Michael & Poling, 2003) the concept gained recognition as an important variable in clinical practice.

6

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

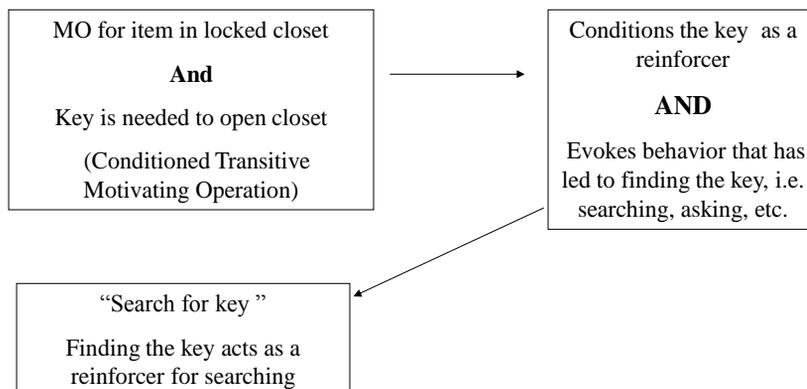
The CMO-T

- The transitive conditioned motivating operation (CMO-T) appears to be most relevant to the conditioning of stimuli and events as reinforcers (Sundberg, 2004) and may play an important role in teaching language and other skills to children with autism who fail to acquire the repertoires through typical means.
- In technical terms Michael (1993) defined the CMO-T as the correlation of a stimulus with the correlation between another stimulus and a form of reinforcement.
- In practical terms, when an item is highly valuable but some additional action, item or even information is necessary to produce the valued item, the necessary item, event or information will now act as a reinforcer for any behavior that would produce it.
- Michael (1988) originally referred to this conditioning effect as blocked access or interrupted chain effect.

- In this way, CMO-T's conditionally condition a variety of previously neutral stimuli as reinforcers and evoke responses that have been reinforced with the now conditioned stimulus.
- See the next slide for an example of the effects of a CMO-T.

9

CMO-T Example



10

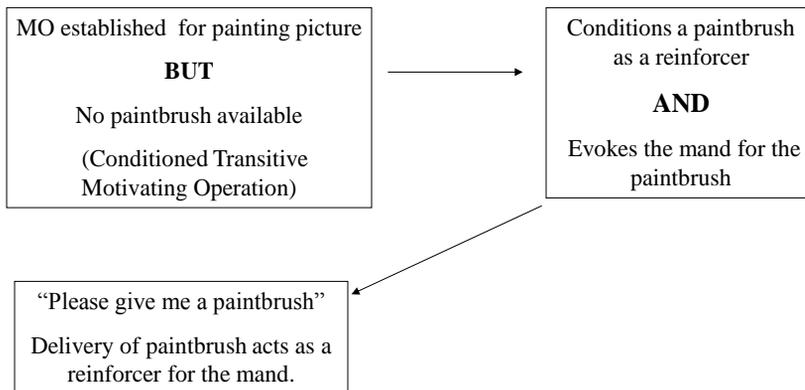
Language Training

- Skinner (1957) defined the mand as, “a verbal operant in which the response form is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation” (pp.35-66).
- The mand is unique because it is the only verbal operant for which a response is directly evoked by a motivating operation (Laraway, Syncerski, Michael & Poling, 2003; Michael, 1988, 1993, 2007)
- The CMO-T provides an effective mechanism for language trainers in applied settings to condition typically encountered items, activities, and actions as reinforcers through blocked access or interrupted chains and consequently increase the range and sophistication of the mand repertoire of persons with developmental disabilities

11

- Hall and Sundberg (1987) demonstrated the benefit of using an interrupted-chain procedure to teach persons with developmental disabilities to mand for missing items needed to complete a chain of responses that ultimately resulted in access to a desirable item.
- For example, one participant was taught to mand “hot water” when that item was needed to complete a soup recipe but was not readily available.
- Hall and Sundberg’s (1987) findings have since been replicated with diverse participants under varying conditions to teaching both mands for missing items and mands for information. (Albert, Carbone, Murray, Hagerty & Sweeney-Kerwin, 2013; Arntzen & Almas, 2002; Betz, Higbee, & Pollard, 2010; Carroll & Hesse, 1987; Endicott & Higbee, 2007; Hall & Sundberg, 1987; Lechago, Carr, Grow, Love, & Almason, 2010; Rosales & Rehfeldt, 2007; Sigafos, Doss, & Reichle, 1989; Sundberg, Loeb, Hail, & Eigenheer, 2002; Ziomek & Rehfeldt, 2008)

Clinical Example of the Application of CMO-T (Interrupted-Chain)



13

- Two recent studies replicated and extended the work of Hall and Sundberg related to teaching mands for missing items to typical children and children with autism studies (Albert, Carbone, Murray, Hagerty & Sweeney-Kerwin, 2013; Sidener, Carr, Karsten, Severston, Cornelius, & Heinicke, 2010).
- In the Albert, et al. (2012) study children with autism were taught to mand for missing items to complete enjoyable activities within the context of an interrupted-chain.
- On the following slides are examples of the interrupted-chains and the vocal mands that were taught.

14

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 J. 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 between 5 and 8 years of age, who would regularly mand for a wide variety of reinforcers when they were present but would rarely 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

Participant and Chain	Materials	Steps
Victor		
Making an art project	Shapes cut from paper, Glue, Glitter	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
Painting a picture	Smock, Paper, Clip, Paintbrush, Water, Paint, Easel	Put on smock, Hand clip to instructor (to clip paper onto easel), Pick up paintbrush, Dip paintbrush in water, Dip paintbrush in paint, Apply paintbrush to paper, Repeat painting steps several times
Making a sandwich	Bread, Toaster , Plate, Peanut butter, Knife	Open bag of bread, Put bread in toaster, Push down toaster button, Take bread out of toaster (after bread has popped back up), Put bread on plate, Open peanut butter, Put peanut butter on knife, Spread peanut butter on bread, Eat sandwich
Nathaniel		
Listening to music	Portable CD player , CD, Headphones	Open CD player, Put CD in CD player, Put headphones on, Press play button, Listen to music
Science project	Plastic container, Bottle of water, Two bottles of food coloring , Spoon	Pour water into container, Drop food coloring into container, Pick up spoon, Mix liquid with spoon
Painting a picture	Smock, Paper, Paintbrush, Water, Paint, Easel	Put on smock, Put paper on easel, Pick up paintbrush, Dip paintbrush in water, Dip paintbrush in paint, Apply paintbrush to paper, Repeat painting steps several times
Carina		
Painting a picture	Smock, Paper, Clip , Paintbrush, Water, Paint, Easel	Put on smock, Hand clip to instructor (to clip paper onto easel), Pick up paintbrush, Dip paintbrush in water, Dip paintbrush in paint, Apply paintbrush to paper, Repeat painting steps several times
Making an art project	Paper, Three crayons, Glue stick, Glitter	Color picture, Rub glue on paper, Sprinkle glitter on top of glue
Making juice	Cup, Powder to make juice, Spoon, two ice cubes, Measuring cups containing water	Scoop powder into cup, Pour water from measuring cups into cup, Mix solution in cup using spoon, Put ice cubes into cup, Drink juice

Note. Materials removed to teach mands for missing items are shown in **boldface**.

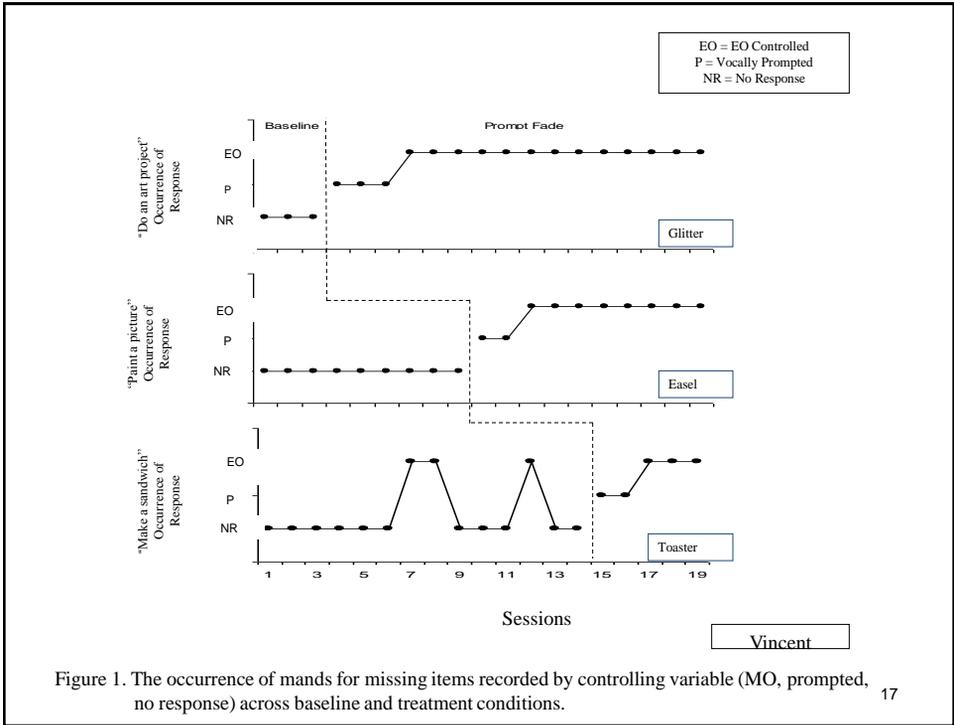
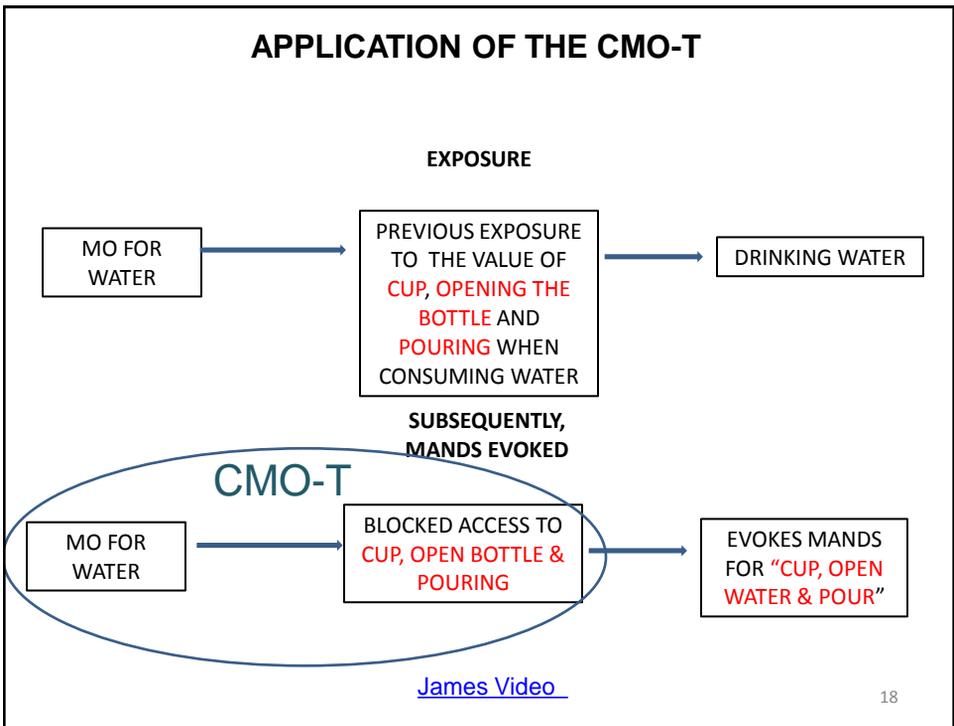


Figure 1. The occurrence of mands for missing items recorded by controlling variable (MO, prompted, no response) across baseline and treatment conditions. 17



CMO-T Lesson Plan for Increasing Mands: Teaching

Learner: Andre
 Date: _____
 Activity: Computer

Y = correct mand topography emitted solely under the control of the CMO-T
 N = incorrect mand topography emitted or correct mand topography emitted following a prompt provided by the instructor

Description of the Routine/Chain: Andre often accompanies his instructor to the computer to watch/listen to music videos on youtube.com. To watch them, he must use the mouse to click in the search box on the you tube website, type in the song/artist name, click on the appropriate icons on the web page to select a video, and turn up the volume on the speakers so he can hear the music.

Objective: Increase opportunities to teach a wider variety of mands by removing items needed to watch/listen to music videos on youtube.com (i.e., contriving a CMO – T).

Set up to Contrive MO	What is conditionally conditioned as a reinforcer?	What should you teach the learner to say?	Probe Data Recording
Andre has an MO to watch/listen to music videos on youtube.com. He arrives at the computer and youtube.com is open. The instructor asks Andre who he would like to listen to. After selecting a song/artist Andre needs to use the mouse to click in the search box to type in the song/artist name, but the mouse is missing.	Mouse	"Mouse"	Y N
Andre has an MO to watch/listen to music videos on youtube.com. After using the mouse to click in the search box to type in the artist/song name, the instructor will tell Andre to type the artist/song title in. The keyboard is missing.	Keyboard	"Keyboard"	Y N
Andre has an MO to watch/listen to music videos on youtube.com. After the song/artist name has been typed in and Andre has selected a video, he presses play, but hears no sound. He attempts to turn up the volume or mands for "volume," at which point the instructor tells him to go ahead and turn up the volume, but the speakers are missing.	Speakers	"Speakers"	Y N

Andre
Manding

Developed by the Staff of the Carbone Clinic. May be copied and distributed with proper attribution.

19

MANDING FOR INFORMATION

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 to which in the past has produced some form of reinforcement (e.g., more effective action by the asker).

20

- Sundberg, Loeb, Hale, and Eigenheer (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 motivating operations.
- Using the analysis of the CMO-T, where access to a reinforcer is blocked or interrupted, you can contrive conditions under which verbal information is conditionally conditioned as a reinforcer and will evoke behavior that has led to information in the past.
- For example, if a child would like to play with a certain toy and a teacher says “sure, lets play with it” but the location of the toy is unknown to the child then INFORMATION about the location of the toy is now valuable and the teacher can now teach the child to say “where” as a mand for information.
- The CMO-T has also been used to teach mands for information to kids with autism (Betz, Higbee, & Pollard, 2010; Endicott & Higbee, 2007; Lechago, Carr, Grow, Love, & Almason, 2010)).

21

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.

22

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)

23

- 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.

[Kellen Manding Info](#)

[# 4 Diego](#)

24

TYLER MANDING FOR INFORMATION

- Tyler’s repertoire of manding for information is strong and therefore requires no prompting. The contrived MOs evoke all of the appropriate mands.
- Note how Jimmy contrives the motivation to increase the value of information as a reinforcer for Tyler.

[TYLER VIDEO](#)

[Kellen Manding Info](#)

25

Sample Lesson Plan

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

26

Sample Lesson Plan TYLER

Contrived MO (MOTIVATION)	What Now Becomes a Reinforcer?	What should you teach the learner to say?	Teacher's Response (Reinforcer)	Data Recording of Prompted and Unprompted
Accidentally turn the train off	Info about why Jimmy turned the train off	<u>Why</u> did you do that?	It was an accident, but I want to play another game	Prompted Spontaneous Novel
I want to play another game...	Info about what game the teacher wants to play	<u>What</u> game?	Perfection	Prompted Spontaneous Novel
Lets go get Perfection	Info about where Perfection is	<u>Where's</u> Perfection?	I don't know where it is, but I know someone who knows	Prompted Spontaneous Novel
I know someone who knows where Perfection is	Info about who knows where Perfection is	<u>Who?</u> (Knows where Perfection is)	Kelly	Prompted Spontaneous Novel
Kelly knows where Perfection is	Info about where Perfection is	<u>Where's</u> Perfection?	In the teacher's room	Prompted Spontaneous Novel

27

Sample Lesson Plan TYLER

Contrived MO (MOTIVATION)	What Now Becomes a Reinforcer?	What should you teach the learner to say?	Teacher's Response (Reinforcer)	Data Recording of Prompted and Unprompted
The closet is locked and the key is missing	Info about where the key is	<u>Where's</u> the key?	I don't know where it is, but I know someone who knows	Prompted Spontaneous Novel
I know someone who knows where the key is...	Info about who knows where the key is	<u>Who?</u>	Danielle	Prompted Spontaneous Novel
Danielle knows where the key is	Info about where the key is	<u>Where's</u> the key?	It is on top of the bookshelf	Prompted Spontaneous Novel
You need to open the door with one of the keys	Info about which key he should use	<u>Which</u> key?	This key	Prompted Spontaneous Novel
Difficulty opening the door with the key	Info about how to open the door?	<u>Where</u> are we going to play?	At the table	Prompted Spontaneous Novel

28

The CMO-T and Social Skills

- Recently researchers and practitioners have acknowledged the value of the MO, and particularly the CMO-T, to teach social skills to children with autism (Carbone, O'Brien, Sweeney-Kerwin, & Albert, 2013; Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004; Holth, 2011; Isaksen & Holth, 2009; Taylor & Hoch, 2008).
- Behavior analytic researchers have suggested that the discrepancy in the acquisition of social skills by children with autism compared to their typical peers may result from the failure of social attention to act as a reinforcer for these children's behavior, (Carbone et al., 2013; Dube et al., 2004; Holth, 2011; Isaksen & Holth, 2009).
- Therefore, methods that successfully condition social attention as a reinforcer may result in important gains in the area of teaching social skills to children with autism.

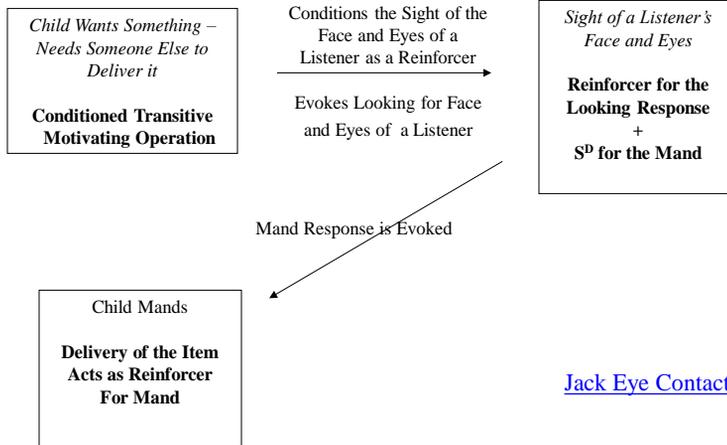
29

- Dube, et al. (2004) implicated the CMO-T as an important variable in conditioning the reactions of adults as reinforcers for bids for joint attention in children with autism.
- More recently, Isaksen and Holth (2009) demonstrated the conditioning of social attention to teach joint attention through manipulation of a relevant CMO-T.
- Carbone et al. (2013), implicated the CMO-T as a variable in conditioning the sight of another's eye as a reinforcer for eye contact in a child with autism while manding.

30

Behavioral Analysis of Eye Contact
During Language Training

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



[Jack Eye Contact Video](#)

Italicized Words = Stimuli
Bold Words = Behavioral Variables
Standard Print Words = Effects of Behavioral Variables

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

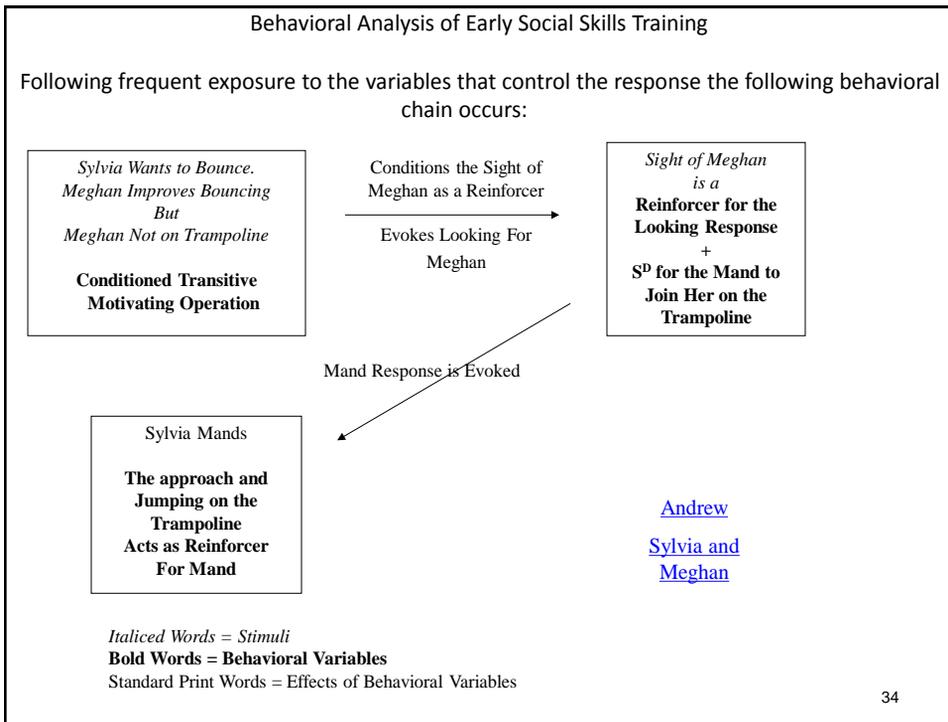
Abstract

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

- Clinically, we have extended this analysis to the teaching of social skills to young children with autism.
- The diagram on the next page provides an analysis of the sources of control for the behavior of inviting others to play as social skill for children with autism.

33



34

- The identification of the CMO-T by Michael, (1993) has provide clinicians with an important tool to teach language and social skills to persons who do not acquire it typically.
- Further research on its application to the acquisition of social skills offers substantial promise for the treatment of persons with autism and related disabilities.

THE END

www.CarboneClinic.com

35

References

- Albert, K. M., Carbone, V., Murray, D., Hagerty, M., Sweeney-Kerwin, E. J. (2013) Increasing the mand repertoire of children with autism through the use of an interrupted chain procedure. *Behavior Analysis in Practice*, 5, 65-76.
- Arntzen, E., & Almas, I. K. (2002). Effects of mand-tact versus tact-only training on the acquisition of tacts. *Journal of Applied Behavior Analysis*, 35, 419–422.
- Betz, A. M., Higbee, T. S., & Pollard, J. S. (2010). Promoting generalization of mands for information used by young children with autism. *Research in Autism Spectrum Disorders*, 4, 501–508.
- Carbone, V.J. (2013). The establishing operation and teaching verbal behavior. *The Analysis of Verbal Behavior*, 29, 45-50.
- Carbone, V., O'Brien, L., Sweeney-Kerwin, E.J., Albert, K. M., (2013). Teaching eye contact to children with autism: A conceptual analysis and single case study. *Education and Treatment of Children*. 36, 130-159.
- Carroll, R. J., & Hesse, B. E. (1987). The effects of alternating mand and tact training on the acquisition of tacts. *The Analysis of Verbal Behavior*, 5, 55–65.
- Dube, W. V., MacDonald, R. P. F., Mansfield, R. C., Holcomb, W. L., & Ahern, W. H. (2004). Toward a behavioral analysis of joint attention. *The Behavior Analyst*, 27, 197–207.
- Endicott, K., & Higbee, T. S. (2007). Contriving motivating operations to evoke mands for information in preschoolers with autism. *Research in Autism Spectrum Disorders*, 1, 210–217.

36

Hall, G. A., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior*, 5, 41-53.

Holth, P. (2011). Joint attention in behavior analysis. In E. A. Mayville & J. A. Mulick (Eds.), *Behavioral Foundations of Effective Autism Treatment*. (pp. 73–89). Cornwall-on-Hudson, NY: Sloan Publishing.

Isaksen, J., & Holth, P. (2009). An operant approach to teaching joint attention skills to children with autism. *Behavioral Interventions*, 24, 215–236.

. Keller, F. S., & Schoenfeld, W. N. (1950). *Principles of psychology*. New York: Appleton-Century-Crofts.

Laraway, S., Snyderski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis*, 36, 407–414.

Lechago, S. A., Carr, J. E., Grow, L. L., Love, J. R., & Almason, S. M. (2010). Mands for information generalize across establishing operations. *Journal of Applied Behavior Analysis*, 43, 381–395.

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior*, 37, 149-155.

Michael, J. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior*, 6,3-9.

Michael, J. (1993). Establishing operations. *The Behavior Analyst*, 16, 191-206.

37

Michael, J. (2000). Implications and refinements of the establishing operation concept. *Journal of Applied Behavior Analysis*, 33, 401-410.

Michael, J. (2007). Motivating operations. In J. O. Cooper, T. E. Heron, & W. L. Heward, *Applied behavior analysis* (2nd ed.) (pp. 374–391). Upper Saddle River NJ: Merrill/Prentice-Hall.

Rosales, R., & Rehfeldt, R. A. (2007). Contriving transitive conditioned establishing operations to establish derived manding skills in adults with severe developmental disabilities. *Journal of Applied Behavior Analysis*, 40, 105–121.

Sidener, T. M., Carr, J. E., Karsten, A. M., Severtson, J. M., Cornelius, C. E., & Heinicke, M. R. (2010). Evaluation of single and mixed verbal operant arrangements for teaching mands and tacts. *The Analysis of Verbal Behavior*, 26, 15–30.

Sigafoos, J., Doss, S., & Reichle, J. (1989). Developing mand and tact repertoires in persons with severe developmental disabilities using graphic symbols. *Research in Developmental Disabilities*, 10, 183–200.

Skinner, B. F. (1957). *Verbal behavior*. Acton, MA: Copley.

Skinner, B. F. (1938). *The behavior of organisms*. New York:

Sundberg, M. L. (2004). A behavioral analysis of motivation and its relation to mand training. In L. W. Williams (Ed.), *Development disabilities: Etiology, assessment, intervention, and integration* (pp. 1-22). Reno, NV: Context Press.

38

Sundberg, M. L., Loeb, M., Hail, L., & Eigenheer, P. (2002). Contriving establishing operations to teach mands for information. *The Analysis of Verbal Behavior*, 18, 14–28.

Taylor, B. A., & Hoch, H. (2008). Teaching children with autism to respond to an initiate bids for joint attention. *Journal of Applied Behavior Analysis*, 41, 377–391.

Ziomek, M. M., & Rehfeldt, R. A. (2008). Investigating the acquisition, generalization and emergence of untrained verbal operants for mands using the picture exchange communication system in adults with severe developmental disabilities. *The Analysis of Verbal Behavior*, 24, 15–30.