Training Nonconventional Autoclitic and Tact Relationships in Children

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TRAINING NONCONVENTIONAL AUTOCLITIC AND TACT
RELATIONSHIPS IN CHILDREN

by

Ingolfur Bergsteinsson

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
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Western Michigan University
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To some extent, one understands a complex aspect of human language if one can produce that kind of language in children who have not already acquired it. Skinner’s (1957) concept of autoclitic secondary verbal behavior is the most complex of his various verbal units, and until recently has not been the subject of experimental analysis. Howard and Rice (1988) made the first attempt to generate an autoclitic repertoire in preschool children, and the present study is an attempt to corroborate and extend their findings. They worked with the autoclitic “like” which identifies the accompanying primary verbal behavior as a form of metaphoric extension, as when we say that a color is “like” red, or an letter is “like” a circle. In the present study four preschool children were taught a similar autoclitic relation, but with nonconventional stimulus material and response forms, so as to decrease the possible effect of their having been exposed to “like” in its ordinary usage, and to the various primary responses that “like” accompanied (colors, common geometric shapes, and letters of the alphabet). The children were trained on generic, metaphoric, and nonexamples of five nonsense symbols or shapes, each of which had a nonsense name (ki, nam, mo, ta, and do). If the figure contained all of its essential features it had to be identified as an
nonsense symbols or shapes, each of which had a nonsense name (ki, nam, mo, ta, and do). If the figure contained all of its essential features it had to be identified as an example of a ki, a nam, a mo, etc. If it contained some but not all of the features (if it was distorted in some way) it had to be identified as a “zola nam,” a “zola mo,” etc. If it was a nonexample it had to be identified as a “taka nam,” a “taka mo,” etc.

Throughout the training, there were tests that assessed the extent to which the various response forms were evoked by novel generic, metaphoric and nonexamples. The three subjects who completed the training on the five symbols showed generalization of the extension autoclitic. All subjects showed generalization of the negation autoclitic (identifying the shape as a nonexample of a particular shape). These results replicate and strengthen the essential findings of Howard and Rice, and are interpreted as furthering the effort to understand complex verbal behavior in terms of environmental variables.
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CHAPTER I

INTRODUCTION

An Overview

This chapter is divided into several sections. The first three are focused on the basic characteristics of Skinner's (1957) approach to verbal behavior and how it contrasts with traditional formulations. In the first section, I will discuss how historically verbal behavior has been viewed as an internally generated phenomenon that cannot be understood and explained using naturalistic concepts and principles. Next, I will describe some of the fundamental properties of Skinner's approach to language and how he attempts to establish linguistic communication as a behavioral event. In the third section, I will discuss Skinner's definition of verbal behavior and compare it with nonverbal behavior.

In the last four sections of this chapter, I will review Skinner's classification of verbal behavior. The main focus is on secondary (autoclitic) verbal behavior since it pertains to the present research. After describing the distinction between primary and secondary verbal behavior, autoclitic tacts will be described in some detail. This will be followed by a review of the research literature on autoclitic tacts, and finally I will describe the specific purpose of the present research.
Traditional Formulations of Verbal Behavior

The study of language has enjoyed a long history. Kantor (1963, p. 204) traces its origin to the invention of linguistics during the Hellenistic period where unique social and commercial interests, especially in Alexandria, made it important to teach, conserve, and study the literary documents of different cultures and languages. With the development of linguistics, textual and vocal products of verbal behavior were established as a legitimate subject matter for a scholarly analysis (Kantor, 1963, p. 205). Historically, the focus of the analysis was primarily descriptive. It consisted of recording verbal practices, and studying relationships between various fixed and formal properties of textual and vocal material (Kantor, 1963, p. 205). The analysis made use of concepts like morphemes, words, sentences, and phrases that are the basic analytical tools in fields like etymology (the study of how words, sentences, and phrases evolve), syntax (the study of rules that describe how words combine to form grammatical sentences), and semantics (the study of word meaning).

The early interest that was shown in words, sentences, and phrases did not generate a similar interest in the verbal behavior itself. To the contrary, with the institutionalization of linguistics, scholars became less interested in the behavioral aspect of language and began to focus with more intensity on their own textual and linguistic products (Kantor, 1963, p. 205). An investigative tradition was established where a scholar would spend most of his time responding to the written words of another scholar, which in turn based his work on the written text of a yet another
scholar. Eventually, the variables that had controlled the original verbal utterance were lost and the naturalistic origin of the behavior became shadowy. Consequently, scholars began to speculate about a hypothetical generator, or creator of words, such as the soul, spirit, and mind (Kantor, 1963). In the process an extraordinary intraverbal repertoire evolved that described various mythological and metaphysical reifications of words, that had little or no direct relevance to concrete objects and events in the physical or the social environment.

Even with the development of modern science and experimental methodology, there continues to be a resistance among those scholars who make language their subject matter to study the individual speaker as he speaks (Skinner, 1957, p. 5). Much of the current approach to language and verbal behavior is still concentrated on the response product of verbal behavior instead of analyzing what “happens when a man speaks or responds to speech” (Skinner, 1957, p. 5). According to one current theory, any attempt to experiment with verbal behavior is doomed to fail simply because verbal behavior is the instrument of thought and self-expression which is believed to be self-initiated and “free from the control of detectable stimuli, either external or internal” (Chomsky, 1972, p. 11-12). In other words, verbal behavior is believed to be beyond the reach of science - not lawfully related to anything that can be scientifically manipulated. Frequently cited evidence for this position are grammatical generalizations observed in children. For example, a child who learns to say “Today I walk, yesterday I walked,” may without any prior training, upon hearing “Today I walk, yesterday I walked,” may without any prior training, upon hearing “Today I
play," say "Yesterday I played." It is concluded from this generalization that what is acquired and known are grammatical rules instead of some stimulus-response relationship (Zuriff, 1985, p. 138).

According to another theory, verbal behavior can be subjected to causal analysis, but it is believed that the causes are primarily internal, and possibly nonmaterial, and thus not readily available for scientific inquiry. There are different variations of this theory, but a common characteristic is that the causes of verbal behavior have been reified into concepts such as "ideas" (Andersen, 1992). Thus, the speaker is said to get an "idea" which gets communicated to the listener via the speaker's verbal behavior. In this framework, the verbal behavior becomes secondary to understanding and investigating the properties of the "idea." Questions such as "Where did the idea come from?" and "What does it refer to or mean?" assume primary importance. Verbal behavior is only important to the extent that it can transfer the idea satisfactorily or else the communication of the idea will be tainted. In fact, according to this type of linguistic theory, the ideal communication would not require verbal behavior at all as a medium. Instead, ideas would be transported directly from one mind to another, thus avoiding any distortions in "meaning" that typically occur when ideas are transferred via verbal behavior.

Aside from providing an easy answer to the origin of verbal behavior, the above conception of verbal behavior simply as a carrier of thought and meaning is likely to derive some strength from the fact that the verbal community establishes
many different response forms as functionally equivalent. For example, a speaker may induce a listener to bring him an apple by pointing to an apple, or alternatively, he may sign, write, or say “give me an apple.” In other words, the speaker can achieve the same reinforcement from the listener with a variety of verbal responses. The verbal community has an interest in downplaying the importance of any particular verbal response form. By endowing the listener with the ability to respond similarly to a wide variety of different response forms, the speaker is provided more responses that will affect the listener’s behavior. If the speaker fails to stimulate the listener’s auditory system appropriately with his vocal behavior, perhaps because of noise or distance, the a pointing or signing repertoire may induce the same behavior in the listener via the visual modality.

The Challenge of Skinner’s Verbal Behavior

In the book Verbal Behavior, Skinner (1957) shows how the complexities of language and verbal behavior can be dealt with from a naturalistic perspective. This perspective is in sharp contrast with the traditional approach to language as it was described above. In Verbal Behavior no reference is made to hypothetical entities, or explanatory mechanisms, that are described in different dimensions and are supposed to take place at some other level of observation. In other words, the analysis is not supported by concepts like “ideas,” “meaning,” “reference,” “memory,” and “representation” which are essential to many mentalistic and cognitive approaches to
language and verbal behavior. Instead, Skinner maintains that for every instance of verbal behavior there is a physical stimulus, or a constellation of stimuli, either in the external or the internal environment. Moreover, he argues that the form and frequency of verbal behavior is determined by its consequences and thus can be understood with the same concepts and principles that describe the behavior of nonverbal organisms in restricted environments. Said differently, Skinner postulates that a complete account of verbal behavior can be provided using the concepts of stimulus, response, and reinforcement that are incorporated into basic behavioral processes, namely, operant conditioning.

Defining Characteristics of Verbal Behavior

The basic unit in Skinner's (1957) analysis of verbal behavior is the verbal operant. The verbal operant is like any other operant in that it can be brought under stimulus control, and its topography and frequency is affected by its consequences. What separates the verbal operant from the nonverbal operant is the maintaining contingency. In nonverbal behavior the maintaining contingency is provided directly by the physical environment. Nonverbal behavior exerts its force on the physical environment which in turn provides differential consequences which shape the form of the behavior and alter its frequency. More specifically, nonverbal behavior:

Alters the environment through mechanical action, and its properties or dimensions are often related in a simple way to the effects produced. When a man walks toward an object, he usually finds himself closer to it; if he reaches for it, physical contact is likely to follow; and if he grasps and lifts it, or
pushes or pulls it, the object frequently changes position in appropriate directions. All this follows from simple geometrical and mechanical principles (Skinner, 1957, p. 1).

The geometrical and mechanical principles that Skinner refers to make the physical environment particularly effective in shaping and maintaining the form of nonverbal behavior (Skinner 1957, p. 203 - 206). First, the physical environment is almost perfectly reliable in producing the same effect for the same behavior. A child lets go of a ball, and the ball will almost always drop down. Second, there is a linear correspondence between the force of the nonverbal behavior and the magnitude of the effect. For example, the brisker the walk, the quicker the person will arrive. Third, the relationship between the form of the nonverbal behavior and the effect it produces is governed by physical necessity. Pulling an object with sufficient force can only result in the object moving closer, whereas pushing the object can only result in the object moving further.

Much of what humans do in a social and a linguistic community cannot be described with the same "push-pull" causality of nonverbal behavior. When a person asks, "Can I please have a glass of water?" the maintaining contingency will not come from the effect that the request has on the physical world, but the social world. The speaker produces vocal sounds which change the behavior of a listener who responds by bringing the speaker a glass of water. The sounds have no mechanical relation to a glass of water. The vocal behavior that produced the sounds was successful only because it affected a listener who had been specifically trained to reinforce the behavior.
of the speaker (Skinner, 1957, p. 224). A behavior such as this, that is reinforced only through the mediation of another person, is what Skinner (1957) defines as verbal behavior.

The fact that verbal behavior is reinforced through the mediation of another person gives it certain dynamic and topographical properties that distinguish it from nonverbal behavior. The reason is that the social contingency that is provided by another person is markedly different from the physical contingency. The geometrical and mechanical principles that work in the physical environment do not operate in the social world. Thus, there is no natural relationship between the form of verbal behavior and its effect in the social world. The relationship is completely conventional, and based on the evolution and history of the verbal community that trained the speaker and the listener (Guerin, 1994). Even within the same verbal community, the same effect can be obtained with different verbal response systems. Instead of producing a vocal response to request a glass of water, a speaker may sign or write for a similar effect.

The absence of a strict mechanical relation between verbal behavior and its effect makes the social contingency much less reliable. The listener is considerably more likely to accidentally reinforce variations in a response form than the physical environment. For example, the listener may inadvertently reinforce a certain mispronunciation which "sounds good" and which may over time become the standard response form. A comparable variation in the nonverbal act of riding a bike may be
punished by the bike rider falling down. This variability in the contingency that maintains verbal behavior is a contributing factor to the evolution of different verbal communities. It explains why, unlike much nonverbal behavior, verbal behavior is likely to keep changing since it has no fixed environmental grounding (Guerin, 1994).

The fact that verbal behavior is reinforced only through the mediation of another person, puts the behavior in a unique social context. Without a listener capable of providing functional consequences, verbal behavior can be said to be meaningless. It is nothing more than muscular movements.

Lastly, verbal behavior is not the same as language (Guerin, 1994). Language is the collection of sounds, signs, and symbols that are produced by verbal behavior. It follows from Skinner’s definition of verbal behavior that these response products do not refer to things and events. Instead, as Guerin (1994, p. 146) points out, verbal response products refer people to things and events.

Two Types of Verbal Behavior

Primary Verbal Behavior

In *Verbal Behavior* Skinner (1957) makes a distinction between two types of verbal behavior that he calls primary and secondary. Primary verbal behavior consists of several elementary verbal relations, all defined in terms of functionally distinct controlling variables (Michael, 1993, chap. 12). These relations encompass behavior such as naming things (the tact relationship), asking for things (the mand relation-
ship), and standard word associations or word sequences (the intraverbal relationship).

Of the primary verbal relations described by Skinner (1957), mands, tacts, and intraverbals are probably the most prevalent in the repertoire of mature speakers. The mand relation is defined as a verbal operant that is controlled by a current unconditioned or conditioned establishing operation (Michael, 1993, chap. 13). The establishing operation increases the reinforcing effectiveness of a particular stimulus condition which functions as the reinforcement for the mand response form. The reinforcement is specified in the mand response form. For example, where water would be an effective form of reinforcement, a speaker may mand water with the command “Give me water!” As is true of all of the other verbal relations, the form of the mand response is arbitrarily determined by the contingencies set up by the verbal society. Verbal behavior has its effect on the verbal community, and it is the verbal community that selects and reinforces the topography of the speaker’s verbal behavior.

The tact relation involves a verbal operant that is controlled by a nonverbal stimulus (Michael, 1993, chap. 12). An example of tacting would be saying “red” in response to a red stimulus, or saying “dog” in response to a picture of a dog. Another important property of the tact relation is that it is maintained by generalized conditioned reinforcement which derives its reinforcing effectiveness from a history of having been paired with a variety of different reinforcers that are effective under different establishing operations. A common example is praise and attention. Before a
child can access a variety of reinforcing events such as edibles, toys, and physical comfort, the child needs first to get the attention of his or her parents. In the process, attention is paired with the availability of these events and its reinforcing effectiveness is installed. The fact that the tact relation is maintained by generalized conditioned reinforcement is significant because it reduces the influence that a current establishing operation may have upon the response form. This is because the reinforcement for the tact response form does not pertain to any particular motivation of the speaker. Generalized conditioned reinforcement of the tact response thus permits the listener to infer something about the variable that controls the tact response “regardless of the condition of the speaker” (Skinner, 1957, p. 83).

The intraverbal relation is comparable to the tact with respect to generalized conditioned reinforcement. However, unlike the tact relation, an intraverbal response is controlled by the response product of a prior verbal response (Skinner, 1957, p. 71). An example would be saying “two” in response to hearing “one,” or saying “Freud” in response to hearing someone say “Psychoanalysis.”

Secondary Verbal Behavior

Although primary verbal relations constitute the principal part of most speakers’ verbal repertoires, there is a relatively small, but significant class of responses left out by that account. These are secondary verbal relations, called autoclitics (leaning on itself) by Skinner (1957, p. 313). If primary verbal behavior is the raw
material out of which verbal interactions are composed, autoclitics are the processes that organize, select, evaluate, and direct the production to ensure its effectiveness (Skinner, 1957, p. 312). Examples of autoclitic response forms are logical and grammatical utterances like “is,” “if,” “the,” “there,” “therefore,” “some,” and “all.” Examples also include “I see,” “I believe,” and “I know,” commonly identified with self-awareness.

Autoclitics are secondary to primary verbal behavior in three ways. First, autoclitics are not emitted in isolation from primary verbal behavior. It does not make much sense to say “the,” “there,” “some,” and “certain” without complementing the speech with something else. Second, the controlling variables are embedded in the primary verbal relationship. The autoclitic concept entails that besides evoking a primary response, distinct aspects of the primary verbal relation, such as strength of the response and clarity of the stimulation, sensory receptors involved, and the motivational state of the speaker, can all function as stimuli for further verbal behavior. In other words, it is postulated that the primary verbal relation itself is a controlling variable for the autoclitic response (Peterson, 1978). Third, the reinforcement for autoclitics is derived from the fact that autoclitics increase the effectiveness of the primary verbal behavior. Autoclitics can be said to enrich the “meaningfulness” of the primary verbal behavior, thus increasing the appropriateness of the listener’s to reaction to it.

Skinner (1957) identified five different types of autoclitics: (1) descriptive, (2) qualifying, (3) quantifying, (4) relational, and (5) manipulative. Unfortunately, the
distinction between these classes is sometimes unclear, and as Howard and Rice (1988) note, often seems topographical rather than functional. A classification that seems more functional is Peterson's (1978) division of autoclitics into tacts and mands. This classification is based on whether the controlling variable is a discriminative stimulus or an establishing operation. A discriminative stimulus controls autoclitic tacts whereas an establishing operation controls autocliltic mands. The following discussion is restricted to autoclitic tacts.

Autoclitic Tacts

Reinforcement

The consequences maintaining autoclitic tacts are generalized conditioned reinforcers (Skinner, 1957). The reinforcing capability of the consequences is derived from the fact that autoclitic tacts increase the effectiveness of primary verbal behavior (Peterson, 1978). This increased effectiveness benefits both the speaker and the listener. The speaker is able to give more precise instructions and descriptions that sharpen his control over the listener's behavior. The listener, on the other hand, benefits because improved instructions and descriptions increase the probability that he will respond appropriately and contact reinforcing contingencies in the natural or the social environment.

To appreciate how autoclitic tacts can increase the effectiveness of primary verbal behavior, consider the verbal utterance "raining." Without an autoclilitic sup-
plement, the expression is not likely to evoke any very specific behavior on the part of
the listener. For example, the expression does not inform the listener if the controlling
variable is a past or present stimulus condition. Preceding the response with the auto­
clitic “It is” (raining) provides this information, and makes it appropriate for the lis­
tener to be concerned with an umbrella or a rain coat. The clarity of the primary re­
response is refined even further if the speaker specifies the nature of the variable evok­
ing the response. For example, if the utterance was based on someone else’s experi­
ence the listener is likely to react differently than if it was evoked by the speaker’s
actually seeing the rain. The speaker conveys this information with the autoclitics
“They say that” (it is raining) or “I see that” (it is raining). Furthermore, the strength
of the controlling relationship is also of concern to the listener, which can be indi­
cated with the autoclitics “I think that” (it is raining) or “I know that” (it is raining).

The preceding examples should make it clear that from the listener’s perspec­
tive, autoclitics are valuable because they add “meaning” to primary verbal responses.
The increased meaning is demonstrated by the listener who reacts to the primary ver­
bal behavior with more precision and success. From the speaker’s perspective, how­
ever, the fact that the listener behaves more successfully, and thus shows better signs
of “understanding,” is reinforcing in various ways (see Schoneberger, 1990 for a de­
tailed discussion of the listener’s understanding). For example, having gained a better
understanding of what the speaker is “talking about,” the listener may respond with a
relevant intraverbal comment that sets the occasion for further social interactions.
(e.g., "I had hoped it would stay sunny today"). The speaker may also find that auto­
colicit tacts result in the listener attending more carefully to his speech. The listener
may not only provide better eye-contact, but also smile and nod more frequently. In
other words, the listener shows more interest in speech that is easier to “understand.”
Providing autoclitic tacts may also be reinforced by diminishing the signs of perplex­
ity on the face of the listener. By providing appropriate autoclitis, the speaker may
be less likely to have to repeat the response, or be confronted with annoying demands
like “What do you mean?” or “Why are you saying that?”

The reinforcement contingencies described so far depend on the presence of
another person doing something to the speaker. Perhaps, the most important conse­
quencies maintaining autoclitic tacts are those that Skinner labeled as automatic rein­
forcement. According to Vaughan and Michael’s (1982) definition:

Automatic reinforcement is reinforcement that is not mediated by the deliber­
ate action of another person - “deliberate” in the sense of action taken because
of the consequences for the other person. It is a “natural” result of behavior
when it operates upon the behaver’s own body or the surrounding world (p.
219).

Given that autoclitic tacts increase the effectiveness of primary verbal behavior when
the listener is another person, the same increased effectiveness should result when the
speaker and the listener are one and the same. The use of autoclitis may automati­
cally help the speaker better understand the situation responsible for the verbal be­
havior and thus strengthen appropriate and relevant parts of the speaker’s repertoire
as a listener.
Acquisition

Having examined the function of autoclitic responding and reviewed some common response forms, one can inspect the acquisition of the behavior and the controlling variables in more detail. Like other types of verbal behavior, Skinner (1957) maintains that autoclitics are imparted by the listener and the verbal community he or she represents. The verbal community has an interest in this process because, as previously explained, autoclitic tacts significantly increase the value of the speaker's verbal behavior to listeners.

The stimuli controlling autoclitic tacts are the stimulus conditions under which primary verbal behavior occurs (Peterson, 1978). This includes conditions like the strength and clarity of the stimulation, the strength of the response, the sensory receptors involved, and the motivational state of the speaker. The process that Skinner (1957) suggests is responsible for bringing autoclitics under the control of these conditions is discrimination training. There are several ways to conduct discrimination training, but the essential feature is that the reinforcement of a particular response form is made contingent on the presence of particular antecedent stimulus conditions. This also means that if the appropriate stimulus conditions are not present, reinforcement will not follow the response (Michael, 1993, Chapter 8).

As Skinner (1957) observes, the discrimination training involved in the acquisition of autoclitics is likely to take advantage of the trainee's existing repertoire as a speaker and a listener. For example, the verbal community may prompt the speaker
with questions like “What did you say?” “Why did you say that?” “Who said that?” and so on. Consider the mother who hears her child say that “It IS raining” when the ground is wet, but no rain falling. The mother may respond by asking the child “Can you feel any raindrops falling on your hand?” If the child has appropriate verbal repertoire to answer the question with the autoclitic “no,” the mother may prompt the child to repeat with her that “It was raining, but now the rain has stopped.” This short interaction may sharpen appropriate autoclitic stimulus control in more than one way. First, the mother’s slightly negative reaction to the response “It is raining” when there is no rain falling is likely to make it less likely to occur in the future under similar circumstances. Second, emitting the autoclitic “It was” (raining) in the presence of a wet ground is reinforced. This should strengthen the control of wet ground over the utterance. Third, the perceptual response that was produced in the child by the vocal stimulus “Can you feel the raindrops” occurred in the presence of wet ground. This may have established wet ground as a conditioned stimulus that is capable of evoking similar perceptual behavior as the vocal stimulus. In other words, the child may come to “hear” the question “Can you feel the raindrops” when conditions are similar to the one where it was originally asked by the mother. If the child finds himself again responding with the autoclitic no, the previous reinforcement history may have established the response as an additional controlling variable for saying “It was” (raining).

The fact that the verbal community can rearrange the speaker’s environment also facilitates relevant discrimination training. For example, to teach her child to tact
the clarity of the variable controlling a primary tact response, a mother may cover the face of a familiar person and ask “Who do you think this is?” Having previously learned to respond to questions about “you” with an answer beginning with “I” the child may immediately respond by echoing “I think this is . . .” which is then followed by a reinforcing smile from the mother. But, if the cover succeeds in obscuring the stimulus, the child will be unable to emit a subsequent tact response. Observing this difficulty, the mother repeats the question and increases the clarity of the stimulus by partially removing the cover. Again, the child echoes “I think this is . . .” which again is followed by a reinforcing smile, but now the child may almost know the answer - it is on the tip of his tongue. The mother responds by removing more of the cover, and now the child hears himself say “Uncle Joe,” which is followed by praise, laughter, and complete removal of the cover. As before, this brief verbal episode is likely to develop stimulus control of the autoclitic response form “I think” in at least three ways. First, saying “I think” is reinforced in response to the verbal stimulus “Who do you think” which may endow it with some control over the behavior. Second, the mother reinforced saying “I think” during a condition when the primary verbal behavior was not readily forthcoming. This may install “hesitancy” or “delay” in responding as an occasion for saying “I think.” Third, saying “I think” was reinforced when the critical variable was only partly visible, which could establish “covering” as a source of control over the response.
Private Stimulus Control

The discrimination training involved in the development of autoclitics is complicated by the fact that much of what the verbal community wants to know about primary verbal relations requires that behavior be brought under the control of private stimuli. A prime example are autoclitics that tact the sensory modality involved in the control of a primary response. The speaker indicates this with phrases like "I felt," "I heard," and "I saw." Presumably, these autoclitic tacts are evoked by private stimulation arising from the act of touching, hearing, or seeing the stimulus object responded to in subsequent verbalization (Skinner, 1957, p. 138).

The complication induced by training private stimulus control is this: How can the verbal community differentially reinforce behavior with respect to stimuli that are, by definition, inaccessible to everyone except the speaker. If the stimuli are inaccessible, how can the verbal community make reinforcement contingent on their presence or absence, which would be required if autoclitics are learned via discrimination training as Skinner (1957, p. 130) argued. The problem of privacy is solved to some extent by making reinforcement contingent on public accompaniments of private stimuli. The verbal community has access to the speaker's own behavior, and features of the external environment, and these may correlate with distinct internal stimulation (Skinner, 1953; 1957). For example, when the speaker says that he sees X, the listener can to some extent verify the claim by noting whether the speaker's eyes are open, whether there is sufficient light, and whether his eyes are oriented toward X. To what
extent the relation between external and internal stimulation is reliable can be, of
course, debated, which is why the verbal community is often skeptical of reports of
private stimulus control (e.g., "I have a headache") (Skinner, 1953).

Private Stimulus Control and Generalization

The fact that the same verbal utterance can be "used" in different settings and
in the presence of physically dissimilar external stimuli has been interpreted by critics
(e.g., Chomsky, 1959) as showing the implausibility of the notion of stimulus control
over verbal behavior. If the situations have no common physical characteristics, how
can they control the same verbal operant? How can "beautiful" be evoked by two dif­
ferent pieces of art that have nothing in common except for being beautiful?

The dilemma is solved by recognizing that physically dissimilar stimuli can
have identical effects on the speaker, and it is to this common effect that the speaker
responds when he emits the same verbal utterance. Thus, control over the response
generalizes across dimensions of the private stimulation instead of the physically dis­
distinct external stimuli. A case in point are autoclities that tact how the speaker is af­
fected emotionally by his speech (Skinner, 1957, p. 316). A speaker carrying "good"
news may report being "Happy to say that..." or "Excited about..." On the other
hand, a speaker who is saddened by his verbal behavior may say "I am sorry about...
or "I hate to inform you..." Needless to say, a definition of "happy" news or "sad"
news cannot use any formal attributes of such events. There are countless different
verbal reports that can make someone happy or sad. Furthermore, although there may be some external features associated with bringing “good” and “bad” news, these features are unlikely to be consistently present. Thus, it seems reasonable to assume that the autoclitic report is controlled by private feelings of “happiness” or “sadness.”

Autoclitics and the Flexibility of Verbal Behavior

One way in which autoclitic tacts increase the effectiveness of primary verbal behavior is by permitting the speaker to talk about that part of the world he has never before contacted, or lacks distinct “words” to describe. There is a substantial body of evidence showing that when children learn to name objects and events in their environment, the naming response is often evoked by novel instances that the adult speaker would refer to with a different name (e.g., Huttenlocher & Smiley, 1987; Kay & Anglin, 1982; Naigles & Gelman, 1995; Rescorla, 1980). A commonly reported example is for a child to say “dog” when seeing a cat or a cow.

In the child language literature, cognitive researchers have pointed out at least two reasons for these “errors.” First, children may not “know” the defining features of the object to which the word refers. For example, a child may define dogs simply as a fury four legged animal and use the word to refer to all animals that meet this definition (Nelson, Rescorla, and Gruendel, 1974). Translated into behavioral terminology, saying “dog” has not been brought under the control of all of the relevant features of the dog stimulus. Consequently, the child may say dog in the presence of stimuli.
containing only few of the relevant features.

A second reason for such erroneous generalization is explained by Nelson et al. (1978) as follows: "[We] suggest that children are actively engaged in categorizing activity and that one of their purposes in using names for novel things is to elaborate for themselves the similarities among things (p. 964)." According to Nelson et al., overextension occurs, not because the child does not know the true defining features of a dog, but because saying "dog" comes closest to describing the unfamiliar animal. What the child is really saying is not that the unfamiliar animal is a dog, but that it is like a dog. Nelson et al. (1978) go on to say that "it is significant that analogical type errors are seldom reported after the one-word stage when the child becomes able to make his meaning clearer by use of sentences (p. 965; italics mine)." What Nelson et al. (1978) are describing is the role that autoclitics play in allowing the speaker to extend the scope of primary verbal behavior to novel or unusual stimulus conditions.

The verbal community makes a distinction between two types of extensions, which Skinner calls generic extension and metaphoric. In generic extension, the primary tact response is caused by a novel stimulus that has all of the relevant features of the stimulus to which the response was originally conditioned (Peterson, 1978). As an example, if a child has been taught to say "dog" in the presence of two different types of dogs (e.g., Cocker Spaniel and Beagle) a tendency to say "dog" in the presence of a new dog, such as a German Shepherd, would be an instance of generic extension (Peterson, 1978). The German Shepherd has all of the defining features of a dog in
common with both the Cocker Spaniel and the Beagle, but in addition contains some novel irrelevant features that are not present in the other dogs.

Generic extensions of a primary tact response typically occur without an accompanying autoclitic because there is no need to modify the listener's reaction to the tact. An exception is when the generic extension involves a stimulus that is very unusual, in which case it may be of practical importance to alert the listener to that fact. For example, a speaker who encounters a chair with a conspicuously short back, may report to the listener that what he saw was a "kind of chair."

In metaphoric extension there is distortion with respect to relevant properties that control the primary verbal behavior. From the standpoint of the verbal community, this distortion is of the sort that makes it questionable whether the primary response should be extended to the stimulus at all. For example, the distortion may prevent the listener from being able to apply all of the behaviors that he would be otherwise able to emit to a generic example, or some special caution needs to be exhibited by the listener. The speaker informs the listener about any such conditions with autoclitics such as "like," "resembling," and "similar." For example, in the presence of an object that resembles a chair, but may not really be a chair, for instance a love seat, a speaker may tact it by saying "It is like a chair" or "It is chairlike." The autoclitics inform the listener that the variable controlling the primary response "chair" is distorted and may not have all the defining features.

If autoclitics provide important flexibility for applying primary verbal behav-
ior to novel aspects of the external world, they are of special importance when it comes to describing the world beneath the speaker's skin. This is recognized by Skinner (1957) as he acknowledges that "most of the vocabulary of emotion is metaphorical in nature" (p. 132). The metaphorical extension sometimes involves a verbal response that has come under joint control of both external and internal stimulation. For example, after having simultaneously seen and felt the emotions evoked by objects and events breaking down and getting ruined, the phrase "breaking down" may come under joint stimulus control of the visual and the emotional aspects of such events. From the speaker's perspective, this joint control can be said to be what defines something as having broken down. The response becomes metaphorical when the speaker starts to apply it in the absence of joint stimulation, such as when appropriate visual stimulation is absent, but the speaker still feels the emotions evoked by such stimulation. This state of affairs is reported by the speaker when he says that he "feels like breaking down." The autoclitic "feels like" indicates to the listener that the primary tact response "breaking down" is controlled by internal stimulation and that relevant external stimulation may be partially or completely absent.

Autoclitic Research

As Skinner (1957) acknowledged, his use of operant terminology to account for verbal behavior is theoretical. Aside from pointing out agreement with well known facts, no attempt is made to validate the analysis. In fact, Skinner (1957) labels
his approach as an “exercise in interpretation, rather than a quantitative extrapolation of rigorous experimental results” (p. 11). Nonetheless, it is clear that the purpose of the analysis was more ambitious. The goal was not just to develop an alternative way of talking about verbal behavior. Instead, the ultimate aim was the prediction and control of specific instances of verbal utterances:

The “understanding” of verbal behavior is something more than the use of a consistent vocabulary with which specific instances may be described. … The criteria are more demanding than that. The extent to which we understand verbal behavior in a “causal” analysis is to be assessed from the extent to which we can predict the occurrence of specific instances and, eventually, from the extent to which we can produce or control such behavior by altering the conditions under which it occurs (1957, p. 3).

In a relatively recent review of the literature, Oah and Dickinson (1989), note that although Verbal Behavior has been available for almost forty years its main effect so far has been to generate further theoretical interpretations. They state that compared to the behavior analytic research on nonverbal behavior “very little empirical work has been generated by Verbal Behavior” (Oah & Dickinson, 1989, p. 53).

The empirical work that currently exists is fairly limited in scope. It focuses almost exclusively on primary verbal relations, like mands and tacts. Moreover, the studies frequently employ developmentally delayed subjects with severe verbal deficiencies. Only one study (Howard and Rice, 1988) has explicitly attempted to investigate Skinner’s conception of secondary verbal behavior or autoclitics. The study employed verbally competent children and its primary goal was to examine the training and generalization of autoclitic tacts.
Howard and Rice's Study

The purpose of Howard and Rice's study was to answer four basic questions about autoclitics: (1) can autoclitic tacts, whose topographies are determined by the experimenters, be trained in a structured setting, (2) will the training lead to generalized autoclitic responding, (3) what are the training components necessary to produce generalized responding, and (4) what are the controlling variables. The subjects were four preschool children who were assessed to be average in their language skills. They were exposed to primary tact training and autoclitic tact training across three sets of stimuli. Each set contained three concepts. One concept was a color (yellow, red, or blue), another was geometrical form (square, circle, or triangle), and the third was a letter of the alphabet (H, L, or M). For each concept there were three generic examples and three metaphoric examples. For example, there were three generic examples of the letter “L,” all demonstrating the same general topography, but varying in size from small, to medium, to large. The three metaphoric examples contained some distortion in the defining property of the concept. For example, the metaphoric examples of red were reddish-purple, reddish-pink, and reddish-orange.

Subjects were first exposed to primary tact training where they were trained to tact generic examples of the three concepts within the first stimulus set. The concepts were trained one after another, so that when the subjects were tacting generic examples of the first concept, they were trained on the second concept and then the third concept. The training on the first concept only included generic examples of that con-
cept. In the training of the second and third concept the previously mastered generic stimulus cards were randomly presented along with the generic examples of the new concept. The tact response forms were standard names of the concepts. For example, in the presence of a generic example of yellow, saying “yellow” was reinforced. When the subjects had completed the tact training of all three concepts in the first stimulus set, they underwent autoclitic tact training. Here, the subjects were trained on metaphoric examples of the concepts they had previously learned to tact. Again the concepts were trained in a sequence one after another. After a subject had mastered the first concept, he or she was trained on the second and then the third. The training on the first concept only included metaphoric examples of that concept. In the training on the second and the third concept the previously mastered metaphoric stimulus cards were randomly presented along with metaphoric examples of the new concept. The autoclitic response form that was trained was “like.” For example, in the presence of a metaphoric example of the letter H (skewed to the right), saying “like H” was reinforced. When the subjects had completed the autoclitic training for all of the three concepts in the first stimulus sets, they were trained on the second and then the third stimulus set using the same procedure.

Autoclitic generalization was assessed throughout both training conditions. During tact training every third training trial “resulted in the trainer randomly presenting one of the three distorted examples for each of the three concepts in that set” (Howard & Rice, 1988, p. 50). For example, after having trained the subject twice on
two generic examples of the first concept (e.g., yellow) in the first stimulus set, the subject was presented with either a metaphoric example of yellow, circle, or the letter H. Responses to this stimulus were simply recorded and not consequtated in any specific way. Autoclitic generalization was assessed in a similar way during the autoclitic tact training. The exception was that “only stimulus cards that portrayed examples of concepts (within that set) to which the subject had not yet been trained to make autoclitic responses were presented. If a subject was currently being trained to make autoclitic responses to all three concepts within a set then no probes were conducted” (p. 51).

After subjects had received primary and autoclitic tact training on all three stimulus sets, they were presented with two nonsense concepts. As before, there were three generic examples and three distorted examples of both concepts. First generic examples of one concept were presented. Subjects were shown a stimulus card, and the trainer modeled the correct tact (“This is shhh”). Then the remaining two examples were presented to the subjects and they were asked “What is this?” with no further prompting or correction. Following this, the three distorted examples of the same concept were immediately presented and the subjects were again asked, “What is this?” Correct responses (to both generic and distorted examples) were reinforced as in earlier training. The same procedure was then repeated with the second nonsense concept.

The results of the study confirmed that autoclitics tacting metaphoric exten-
sion of a primary tact could be trained in a structured setting. After autoclitic training began with the first set of stimuli, substantial generalization was observed in two of the four subjects. The other two showed a different pattern of generalization. One subject did not show significant generalization until working on the third stimulus set, and the other one, who only received training on the first two sets, showed a slow but gradual acquisition of generalized responding on both stimulus sets. Results were more mixed with respect to the nonsense concepts taught at the end of the study. For two subjects, the percentage of correct autoclitic responses was 66, but for the other two subjects, the same score was 50% and 0%. In other words, earlier demonstration of autoclitic generalization did not seem to transfer as robustly to less familiar nonsense concepts.

Regarding the question, what sort of training is required to produce generalized autoclitic tacts, two main inferences are supported by the data. First, validation was provided for Skinner's (1957) hypothesis that primary tacts and autoclitic tacts are different repertoires requiring different forms of training. Results showed that the acquisition of primary tacts is not a sufficient basis for generalized autoclitics to emerge (Howard & Rice, 1988, p. 56). Usually, no autoclitic generalization was observed until subjects had received autoclitic training. An exception came from a single child who was recorded emitting autoclitics after having received only tact training. However, as the experimenters note, these autoclitics were few, and probably due to a prior training history. Second, the pattern of autoclitic generalization suggests
that "autoclitic training needs to be conducted with more than one concept before generalization is likely to occur" (p. 56). Only after having been introduced to distorted examples of two or more concepts did autoclitic generalization begin to increase. This suggested to the experimenters the possibility that "many of the responses emitted during autoclitic training trials were, at least initially, just primary tacts with more complicated response forms" (p. 56).

The design of the study does not permit strong inferences about the variables controlling the autoclitic responding. Howard and Rice (1988) speculate that the autoclitics were evoked by weakness in the primary tact resulting from distortion in the controlling variable. Although this interpretation is plausible and consistent with Skinner's (1957) analysis, this control was not explicitly demonstrated. Furthermore, no attempt was made to measure the strength of the primary tacts in the presence of generic and distorted stimuli. As a result, Howard and Rice's interpretation remains to be validated empirically.

The Need for Further Research

Howard and Rice's (1988) study provides behavior analysts with a valuable starting point for further examining Skinner's conception of autoclitics. At least two reasons can be given why future research efforts should concentrate on autoclitics. First, much of the technological and practical benefits that Skinner (1957) said would come from his interpretations of verbal behavior are dependent on the idea of autocli-
tics. Research is needed to actualize these benefits and tie them more firmly to the autoclitic hypothesis. For example, Alessi (1987) has suggested that autoclitic frames can be used as a generative teaching strategy that maximizes the size of a "novel repertoire after teaching only a minimum number of discrete stimulus response relationships" (p. 15). He notes, however, that even though there is research showing the effectiveness of this kind of an instructional approach, "it is still not entirely clear how basic behavioral principles, or combinations of principles, account for [its] effectiveness" (p. 15). This understanding can only come from autoclitic research. Without it, it is unlikely that behavior analysts will have anything new to contribute to the future development and refinement of autoclitic instructional approaches.

The second reason for studying autoclitics is primarily theoretical, but also involves establishing further credibility for Skinner's analysis among outside scholars. According to MacCorquodale (1969), autoclitics are the "most subtle, complex, and innovative aspect of Verbal Behavior" (p. 839). This is because autoclitics are supposed to explain the creativity, flexibility, and the grammatical structure of language, which according to linguists such as Chomsky (1972), resist any explanation in terms of learning history. It is tragic that Verbal Behavior never entered seriously into the mainstream discussion of language and verbal behavior. The chances that it will do so in the future are going to be even less if behavior analysts do not take on the challenge and produce the data necessary to support Skinner's interpretations of complex verbal phenomena. After all, experimental control is the ultimate criterion by which
Skinner wanted scholars to evaluate and accept his work.

**Purpose of the Present Study**

The purpose of this study is to examine the functional relation that Skinner (1957) predicts exists between autoclitic tacts and the variables controlling primary verbal behavior. Drawing from the work done by Howard and Rice (1988), the study attempted to answer the following questions: (a) is it possible to train an autoclitic denoting extension of the primary tact response using completely nonconventional response forms and stimuli, (b) is it possible to train an autoclitic denoting the absence of an appropriate primary tact response using completely nonconventional response forms and stimuli, (c) will the training lead to a generalized autoclitic responding.
CHAPTER II

METHODS

Subjects and Setting

The subjects were four preschool children; two girls and two boys. At the beginning of the study, the youngest subject was four years and one month old, and the oldest was four years and ten months old. All attended the Orinda Village Preschool (in Orinda, California) for five days each week. The subjects were judged by their teachers to be average in verbal development, and generally cooperative. Sessions were conducted individually at the Preschool in a hallway outside one of the classrooms. The hallway (approximately 1.5 m x 3 m x 2.5 m) contained a table and two chairs.

Approval for the experiment was obtained from Western Michigan University’s Human Subjects Institutional Review Board (Appendix A). Parents were informed as to the nature of the study, and their permission was obtained beforehand (Appendix A).

Stimulus Material and Response Forms

The stimulus material was constructed from five distinct symbols that had not been part of the subjects’ curriculum (see Appendix B). For example, one symbol was
from the Greek alphabet, and another one was the like the letter Y turned upside down. The symbols were printed on the center of a white index card (3.5" x 5").

There were three different exemplifications of each symbol: generic examples, metaphoric examples, and nonexamples (see Appendix B). The three exemplifications varied in how they portrayed the shape of the symbol. The shape of the symbol was the defining feature that determined what kind of verbal response would be reinforced. Other variations in non-defining properties were irrelevant for identifying the symbol. In other words, a non-defining property did not predict what response form would be reinforced. In this study, the non-defining properties were the size and the fill pattern of the symbol (see Appendix B).

There were seven generic examples for each symbol. These examples contained the same defining property (shape), but the non-defining properties (size and fill pattern) was varied among the seven examples. For instance, in the seven generic examples of the symbol labeled as \( ki \), the shapes were identical, but the size and the fill pattern varied. In one example, \( ki \) was shown 5 cm long and 3.1 cm wide and the shape was filled with horizontal stripes. In another example, \( ki \) was shown 6.2 cm long and 3.7 cm wide and the shape was filled with dots (see Appendix B).

There were four metaphoric examples of each symbol. These examples had comparable variations in the same non-defining properties (size and fill pattern) as the generic examples of the same symbol. However, compared to a generic example, the shape of the symbol in a metaphoric example was distorted. The shape was skewed,
or some feature of the shape was disproportional. The four metaphoric examples illustrated different distortions. For example, in one of the metaphoric examples of ki, the symbol was skewed to the right, and the right arm was extended upwards. In another metaphoric example of ki, the shape was skewed to the left and the left arm was extended in both directions (see Appendix B).

There were seven nonexamples of each of the five symbols. The nonexamples consisted of symbols that were considered to be radically different in shape from each other and from the generic examples (see Appendix B). The nonexamples contained variations in the same non-defining properties as both the generic examples and the metaphorical examples.

Subjects were trained to tact each of the five symbols with five distinct response forms: ki, nam, mo, ta, and do. The pairing of a symbol and a response form was arbitrary. Subjects were trained on two autoclitic response forms, zola for a metaphoric example and taka for a nonexample.

Observation and Reliability

The dependent measure was the number of correct verbal responses during training and generalization testing. In response to a generic example of a symbol, a correct response was defined as the appropriate primary tact response (naming the symbol). Responses were scored as incorrect if no response occurred within 10 seconds from the start of the trial, or if the response form was not accurate. In the pres-
ence of a metaphoric example, a correct response was defined as saying *zola*, and then the correct name of the symbol. Responses were scored as incorrect if one of the two response forms were incorrect or missing or if no response occurred within 10 seconds from the start of the trial. In the presence of a nonexample of a symbol, a correct response was defined as saying *taka*, and then the name of the symbol that was being trained or tested. Responses were scored as incorrect if one of the two response forms were incorrect or missing, or if no response occurred within 10 seconds from the start of the trial.

The dependent measures were recorded by the experimenter. All sessions where autoclitic generalization was assessed were tape recorded for a later review by an independent observer. The independent observer recorded each response verbatim on a data sheet that indicated the order of presentation of the stimulus cards. An agreement was defined as an exact match between a response recorded by the trainer and the independent observer. Scores by the trainer and the independent observer were compared by calculating the number of agreements divided by the number of agreements plus disagreements. Reliability was calculated from 12 of the 24 generalization tests that were conducted. The average reliability on those tests was 99.9% with range from 100% to 99.8%.

**Procedure**

The five symbols were trained in a sequence one after another. Subjects were
first trained on the symbol named \textit{ki}. When the training criterion was met, they were next trained on \textit{nam}, followed by training on \textit{mo}, and then \textit{ta}, and then the last symbol \textit{do}. The training of a particular symbol was divided into three successive phases, described below. Generalization was assessed following the training on the first phase, and again after the second phase. (Because the second phase incorporated stimulus material that exemplified a previously trained symbol, the training on the first symbol, \textit{ki}, could only consist of the first and the third phase.)

\textbf{Phase I Training}

In the first phase of the symbol training, subjects were trained on three generic and three nonexamples of a symbol. A training session began with the trainer mixing the six index cards containing the stimulus material. The trainer then presented one of the cards and asked the subject, “Can you tell me what this is?” If no response was given within 10 seconds, or an incorrect response (which was inevitable when the symbol was first introduced and the subject had not yet heard its name), the trainer said the name of the symbol and withdraw the stimulus. For example, if the subject said “A bird” on being shown an example of \textit{mo} (the symbol looks a little like a bird) or said “I don’t know,” the trainer reacted by saying “This is \textit{mo}” and then removing the stimulus. (If during the training of the \textit{mo} symbol the subject was shown a nonexample, the correct response was \textit{taka mo}.) A few seconds later, the subject was shown the same stimulus again and the trial repeated with the same prompt “Can you
tell me what this is?"

The trial was repeated until the subject gave a correct response within 10 seconds. When that occurred (either on the first trial or the ones that had to be repeated) the trainer provided verbal praise and prompted the subject to stamp a “happy face” on a stamp sheet that contained 12 designated stamping areas. The trainer said something like “That is correct. You can stamp now.” Thereafter, a new trial was initiated with the presentation of one of the remaining stimulus cards. When the subject had given a correct answer to all six of the cards in the stack, the trainer presented them once again using the same procedure. Once that was finished (i.e., the subject had completed 12 trials), the training session was over, and the subject was allowed to engage in a preferred activity for a few minutes. For example, a subject could choose between drawing a picture, painting, and playing with dolls and toys. If the subject completed three training sessions on the same day, he or she was allowed to pick a small prize. The prizes consisted of items such as stickers, ornaments, cars, balloons, and animal symbols.

The training criterion for the first phase of the training was met when the subject made no more than one error during the last three sessions.

Generalization Test I

After completing the first phase of the symbol training, subjects were presented with generalization probes (except with respect to the first concept, \( k_i \)). The
probes consisted of the four untrained generic examples and the four untrained non-
examples of the symbol that was being trained. The purpose of this generalization test
was to answer two questions. First, to what extent was the primary tact response that
was trained to the three generic examples during the first training phase controlled by
the defining features of the symbol. If the primary tact was under appropriate control,
novel generic examples should evoke the same response form as the trained exam-
pies. That is, if the subject was correctly saying *mo* to the three generic examples
during the training phase the untrained generic examples should also evoke the re-
sponse *mo*. The second question concerned the degree to which the novel nonexam-
ples would evoke the *taka* autoclitic. Having been taught to say *taka mo* to the three
nonexamples of the first training phase, would the four new nonexamples also evoke
*taka mo*?

Before presenting the generalization probes, the subject was required to re-
view the stimulus material from the previous training phase. The review was con-
ducted like a regular training session. If more than one trial had to be repeated for the
subject to make the correct response, the session was repeated. Otherwise the eight
generalization cards, four generic and four nonexamples, were added to the three ge-
neric and three nonexamples that were taught in the first training phase, and the gen-
eralization testing was begun.

After mixing the 14 cards, the experimenter presented them to the subject, one
at a time, each time asking “Can you tell me what this is?” Responses during gener-
alization testing were not consequated in any special way by the experimenter. No verbal reinforcement was provided, and the stamp sheet and the “happy-face” stamp were removed. When the cards had been shown to the subject once, there was a few minutes break during which the subject was allowed to engage in a preferred activity. Afterwards, the experimenter mixed the 14 cards again and showed them to the subject once more. In other words, the subject was tested twice on the same generalization probe. The reason for this was to obtain a more reliable measure.

Phase II Training

The second phase of the training was conducted following the first generalization test. The primary purpose of this phase was to prepare the subjects for the second generalization test where it would be determined whether the untrained metaphoric examples of the symbol that was being trained would evoke the zola autoclitic that had been learned in training with previous symbols.

The 12 stimulus cards used in this training phase were the four untrained generic examples that had been used in the first generalization test with the symbol currently being trained, and the four generic and four metaphoric examples that had been used in the second generalization test and in Phase III training with the symbol that had been previously trained. For example, after subjects had completed the first generalization test for the third symbol mo, they were trained on the four untrained generic examples of mo, (that had been used in the first generalization test for mo) as
well as four generic and four metaphoric examples of nam. (Because there was no re-
view material for the first symbol, ki, this training phase did not occur until the sec-
ond symbol, nam, was trained.

There were several reasons for this training arrangement. First, the training on
the new generic examples should sharpen appropriate control by the defining features
of the symbol. The control exerted by the defining features of the symbol mo over the
primary tact response, mo, should be enhanced even further by training the subjects
on additional generic examples of mo. Second, reviewing the generic and metaphoric
examples of a previously trained symbol (nam in the present example) should bring
the extension autoclitic, zola, under better control when the subjects have to react to
untrained metaphoric examples of the symbol being currently trained (mo, in the pre-
sent example) in the second generalization test (described below). A third reason was
to expose the subjects to a more elaborate history where reinforcement from the
trainer was contingent on the subject’s responding differentially to generic and meta-
phoric examples.

The same training procedure and training criterion was used in this phase as
was described for the first phase of the training. The exception was that the trainer
only went through the stimulus cards once during a training session for a total of 12
trials.

Generalization Test II

After meeting the training criterion for the second phase, subjects were pre-
sented with a second set of generalization probes (except for the first symbol, $ki$). The probes consisted of the four untrained metaphoric examples of the symbol that was being trained. The purpose was to determine the extent to which the novel metaphoric examples evoked the extension autoclitic, $zola$.

Before presenting the generalization probes, the 12 stimulus cards from the second training phase were reviewed. The review was conducted like a regular training session. If more than one trial had to be repeated for the subject to make the correct response, the session was repeated. Otherwise the four generalization probes were added to the 12 review cards and the generalization testing was begun.

This generalization testing was conducted in the same way as the first one. After mixing the generalization and the review cards, the experimenter presented them to the subject, one at a time, each time asking “Can you tell me what this is?” Responses during generalization testing were not consequated in any special way by the experimenter. No verbal reinforcement was provided, and the stamp sheet and the happy-face stamp were removed. When the cards had been shown to the subject once, there was a few minutes break during which the subject was allowed to engage in a preferred activity. Afterwards, the experimenter mixed the stimulus cards and showed them to the subject again. There were thus eight presentations of the four untrained metaphoric examples.
Phase III Training

When the second generalization test was completed, the last phase of the symbol training was started. Here, subjects continued to be trained on the four generic examples that were used in the second phase of the symbol training, in addition to the four untrained nonexamples used in the first generalization test and the four untrained metaphoric examples used in the second generalization test. The same training procedure and training criterion was used as in the previous training phases. The purpose of this training with respect to a particular symbol (for example, mo) was to establish more firmly the correct autoclitic response forms (zola and taka) to the untrained stimuli regardless of whether or not the subjects had previously demonstrated appropriate generalization, and increase the likelihood that they would occur appropriately to metaphoric and nonexamples of the subsequent symbols (ta and do). Because it was the last symbol trained there was no phase III training with do.

The same training procedure and criterion was used as in previous training phases. As in Phase II, the trainer needed only go through the cards once in a session for a total of 12 trials.
CHAPTER III

RESULTS

Training

Number of Correct Responses

Figures 1–4 show the number of correct responses that the subjects made on their first attempt when shown a stimulus card and asked "Can you tell me what this is?" In other words, the figures show the number of trials in a training session (all consisting of 12 trials) that did not need to be repeated because of an incorrect response. These figures show that for the three subjects (1, 3, and 4) who were exposed to all 5 symbols, phase I performance systematically improved from the first (ki) to the last (do) symbol. There were no similar systematic changes in phase II and phase III performances. There was a good deal of variability in the different subject's performance with respect to the different symbols, but these data do not suggest that any particular symbol was generally more difficult to deal with than any other symbol, however the present sample is too small to detect any but large differences of this type.

Number and Distribution of Errors

Table 1 shows the number and distribution of erroneous responses evoked by
Figure 1. Number of Correct Responses for Subject 1.
Figure 2. Number of Correct Responses for Subject 2.
Figure 3. Number of Correct Responses for Subject 3.
the generic and nonexamples used in the first phase of the training. As the table shows, the generic and the nonexamples were responsible for approximately the same number

Table 1

Number and Distribution of Errors During Phase I Training

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 3 4 4</td>
</tr>
<tr>
<td>Generic Examples</td>
<td>26 12 46</td>
</tr>
<tr>
<td>Nonexamples</td>
<td>25 14 67</td>
</tr>
<tr>
<td>Total Number of Errors during Phase I</td>
<td>51 26 113</td>
</tr>
</tbody>
</table>

of errors in the first phase of the training. By far the most frequent error for all subjects especially for the first two symbols, was to mistake a generic example for a nonexample and vice versa. An example of this type of error is to say taka ki for a generic extension of the symbol and ki for a nonexample. As the subjects were exposed to more symbols, there was more variability in the errors. For example, Subject 4 responded nam to a generic example of the symbol mo and taka nam to a generic extension of the symbol ta. In other words, the names of previously trained symbols began to appear as errors in the training of subsequent symbols. This past training,
however, did not seem to cause much difficulty for the subjects because there was a significant drop in the number of errors for both Subjects 1 and 4 as they were trained on more symbols. Thus, Subject 1 made a total of 51 errors during the first phase of the training, but 39 of these were made on the first symbol and only 12 on the remaining four. Similarly, Subject 4 made a total of 113 errors, 100 on the first two symbols and only 13 on the last three. Subject 3 made only 26 errors during the first training phase, and of these 14 were made on the second symbol and the remaining 12 were distributed over the other four symbols.

Table 2 shows the number and distribution of errors that Subjects 1, 3, and 4 made to the stimulus cards that were used in the second phase of the training. Overall, the subjects made fewer errors on the second phase of the training than the first. This is not surprising given that eight of the 12 stimulus cards were a review of a previously trained symbol. Subject 3 made only 14 errors and these were fairly evenly distributed across the three kinds of stimulus cards. Subject 1 made 42 errors and 26 of those were made on the four metaphoric stimulus cards, most notably those that reviewed nam (15 errors) and mo (9 errors). One type of error that Subject 1 made was to accompany the correct extension autoclitic zola with an incorrect primary tact response that referred to a different symbol. For example, when the symbol mo was being trained in the second training phase, instead of saying zola nam in response to a metaphoric example of nam, Subject 1 said several times zola mo. This would have been the correct response to the novel metaphoric examples of mo that were shown on
Table 2

Number and Distribution of Errors During Phase II Training

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Generic Examples</td>
<td>9</td>
</tr>
<tr>
<td>Generic Examples (Review)</td>
<td>7</td>
</tr>
<tr>
<td>Metaphoric Examples (Review)</td>
<td>26</td>
</tr>
<tr>
<td>Total Number of Errors</td>
<td>42</td>
</tr>
</tbody>
</table>

the following generalization test. The reason for this error could be that after having correctly tacted the metaphoric quality of the stimulus with the autoclitic zola, the incorrect primary tact response mo occurred simply because of the strength the response had gained during the previous training phase where the subject was trained on generic and nonexamples of that symbol. Another type of error that Subject 1 made to the metaphoric stimulus cards was to assert the negation autoclitic taka and accompany it with the name of the symbol that was being trained. For example, the subject said taka ta in response to metaphoric examples of mo. Compared to the generic examples of the symbol ta that was currently being trained, metaphoric examples of mo were nonexamples, and it is possible that the error was appropriately controlled by
that fact. These same types of errors were also demonstrated by Subject 4.

Table 3 shows the number and distribution of errors the subjects made to the stimulus cards used in the third phase of the training. In this phase, Subjects 1 and

Table 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Stimuli</th>
<th>Generic Examples</th>
<th>Nonexamples</th>
<th>Metaphoric Examples</th>
<th>Total Number of Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>35</td>
<td>21</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>5</td>
<td>36</td>
<td>15</td>
<td>56</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>31</td>
<td>64</td>
<td>59</td>
<td>154</td>
</tr>
</tbody>
</table>

3 made relatively few errors to the generic stimulus cards. Of the 57 errors that Subject 1 made, only one was made in response to a generic stimulus card. The rest was evoked by the nonexamples and the metaphoric examples. A similar pattern was seen in Subject 3 who made 5 errors in response to the generic examples, 36 in response to nonexamples and 15 in response to metaphoric examples. Of the 31 errors that Subject 4 made to the generic examples, 30 were made on the first symbol, and only one
error by the other three symbols. In regards to the metaphoric examples, a frequent error for all subjects was the omission of an appropriate extension autoclitic. Subjects gave the correct primary tact but failed to specify the metaphoric aspect of the stimulus card. Another frequent error was the inappropriate extension of both the negation autoclitic and the extension autoclitic. For example, a subject called a metaphoric example of *mo taka mo* instead of *zola mo*, and a nonexample of *mo* was called *zola mo*.

**Generalization Test I**

**Generic Examples**

Tables 4, 5, and 6 show how Subjects 1, 3, and 4 responded to untrained generic examples on the generalization tests. Again, Subject 2 was only available for one test. On this test, all responses consisted of the correct primary tact. Subjects 1 and 3 consistently applied the correct primary tact response to the untrained generic examples but Subject 4 made some errors on *mo* and *ta*.

**Nonexamples**

Tables 7, 8, and 9 show how Subjects 1, 3, and 4 responded to untrained nonexamples on the generalization tests. Subject 2 was only available for one test. On this test, all responses were classified as correct negation autoclitics used with the correct primary tact. Subject 3 showed perfect generalization and Subject 1 only made a
few errors. Subject 4 made the correct generalization response more than any other responses but made several errors on the fourth and fifth symbols that suggested relatively poor control over this autoclitic.

Table 4
Subject 1 - Distribution of Responses to Generic Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct primary tact</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 5
Subject 3 - Distribution of Responses to Generic Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct primary tact</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

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Table 6
Subject 4 - Distribution of Responses to Generic Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct primary tact</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Incorrect primary tact</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 7
Subject 1 - Distribution of Responses to Nonexamples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct negation autoclitic used with correct primary tact</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Correct negation autoclitic used with incorrect primary tact</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Correct primary tact used without any autoclitic</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Incorrect primary tact without any autoclitic</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

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Table 8
Subject 3 - Distribution of Responses to Nonexamples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct negation autoclitic used with correct primary tact</td>
<td>Nam: 8  Mo: 8  Ta: 8  Do: 8</td>
</tr>
</tbody>
</table>

Table 9
Subject 4 - Distribution of Responses to Nonexamples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct negation autoclitic used with correct primary tact</td>
<td>Nam: 8  Mo: 6  Ta: 4  Do: 6</td>
</tr>
<tr>
<td>Correct negation autoclitic used with incorrect primary tact</td>
<td>Nam: 0  Mo: 2  Ta: 1  Do: 0</td>
</tr>
<tr>
<td>Correct primary tact used without any autoclitic</td>
<td>Nam: 0  Mo: 0  Ta: 2  Do: 0</td>
</tr>
<tr>
<td>Incorrect primary tact used without any autoclitic</td>
<td>Nam: 0  Mo: 0  Ta: 1  Do: 0</td>
</tr>
</tbody>
</table>
Table 9 - Continued

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect extension autoclitic used with correct primary tact</td>
<td>Nam</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Generalization Test II

Subject 2 was only available for one test. On this test, seven out of eight responses were recorded as the correct primary tact but without any autoclitic, and for one of the stimuli no response was made. Tables 10, 11, and 12, show how Subjects 1, 3 and 4 responded to the untrained metaphoric examples on this generalization test. The generalization observed in these subjects showed a similar pattern. No generalization was observed for the first two tests. The most frequent response option on these tests was the correct primary tact response without any autoclitic. On the third test, the form of the primary tact response became more variable. Simultaneously, the subjects began to accompany the primary tact response with an autoclitic. For Subjects 3 and 4, half of the autoclitic responses were the negation autoclitic. Furthermore, on more than half of the occasions where the appropriate extension autoclitic was emitted, the primary tact response was incorrect.
Table 10

Subject 1 - Distribution of Responses to Metaphoric Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nam</td>
</tr>
<tr>
<td>Correct extension autoclitic used with correct primary tact</td>
<td>0</td>
</tr>
<tr>
<td>Correct extension autoclitic used with incorrect primary tact</td>
<td>0</td>
</tr>
<tr>
<td>Correct primary tact without any autoclitic</td>
<td>8</td>
</tr>
</tbody>
</table>

For example, six of the primary tact responses emitted by Subject 1 were accompanied by an appropriate extension autoclitic on the third test. However, more than half of the primary tact responses that were accompanied by the autoclitic were incorrect. The incorrect tact invariably named the symbol that was trained previously. Thus, the subject said *zola mo* instead of *zola ta*. On the fourth generalization test, Subject 1 made fewer incorrect primary tacts. Also, the frequency of the appropriate extension autoclitic increased for all subjects.
Table 11
Subject 3 - Distribution of Responses to Metaphoric Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct extension autoclitic used with correct primary tact</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Incorrect negation autoclitic used with correct primary tact</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Incorrect primary tact without any autoclitic</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Correct primary tact without any autoclitic</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 12
Subject 4 - Distribution of Responses to Metaphoric Examples on Generalization Tests

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Nam</th>
<th>Mo</th>
<th>Ta</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct extension autoclitic used with correct primary tact</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 12 - Continued

<table>
<thead>
<tr>
<th>Response Form</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct extension autoclitic used with incorrect primary tact</td>
<td>0 0 0 1</td>
</tr>
<tr>
<td>Incorrect negation autoclitic used with incorrect primary tact</td>
<td>0 0 1 0</td>
</tr>
<tr>
<td>Correct primary tact without any autoclitic</td>
<td>8 8 6 2</td>
</tr>
</tbody>
</table>
CHAPTER IV

DISCUSSION

Training and Generalization of the Primary Verbal Behavior

The untrained generic examples that were employed in the first generalization test assessed to what extent the primary verbal behavior that was trained during the first phase of the training was appropriately controlled by abstract features of the symbol. Since both the negation autoclitic and the extension autoclitic are presumably controlled by conditions that affect the strength and control of the primary verbal behavior, it was important to assess the quality and accuracy of this control. If the primary verbal behavior was not evoked correctly by these untrained examples, this would indicate that the behavior was controlled by dimensions that were not systematically manipulated in the metaphoric examples. Thus, it would have been impossible to train the appropriate extension autoclitic.

The results from the first generalization test show that the training was largely successful in bringing the primary verbal behavior under the control of the defining features of the symbols. For Subjects 1 and 3 all untrained generic examples evoked the correct primary response form (see Tables 4 and 5). Subject 4 made three errors on Mo and two on Ta, all of which consisted in a previously trained primary response form with no autoclitic (see Table 6). A possible explanation for these errors is that
the primary verbal behavior was emitted partly as a generalized autoclitic. It could be that when Subject 4 was trained on generic and nonexamples of nam during the first training phase, the response nam was controlled not only by the abstract features defining the generic examples, but also by the fact that it was not a nonexample. The subject may have said nam in response to a generic example of mo because it did not affect him in the same way as the nonexamples, in that it did not strengthen saying taka.

Besides examining how subjects responded to the untrained generic examples on the generalization test, the quality of the abstract stimulus control that was established in the first phase of the training over the primary verbal behavior can also be assessed by examining how the subjects responded to these examples when they were incorporated into subsequent training phases. As Tables 2 and 3 show, all subjects made relatively few errors to the generic examples, in both the second and the third training phase, thus providing further evidence that their primary verbal behavior was under sharp control. Figures, 1, 3, and 4 show that the subjects made fewer errors and tended to require fewer training sessions to meet the training criterion for the first phase. In other words, the subjects made fewer errors during this phase as they were exposed to more symbols. This suggests that the acquisition of one primary tact facilitated the acquisition of another primary tact to generic examples of a different symbol. This facilitation is to be expected because in the process of acquiring a primary tact in response to the defining features of one symbol, inappropriate responding
to irrelevant features that were common among both generic and nonexamples of subsequent symbols is likely to have been extinguished.

Training and Generalization of the Negation Autoclitic

To assert that a stimulus is not an example of a particular symbol or a class of stimuli, there must be some variable causing the speaker to state the opposite, that it actually is an example (Skinner, 1957, p. 322). In other words, for a speaker to say “not raining,” there must be something that induces him to say “raining.” The negation autoclitic “not” tells the listener that although the primary response “raining” may be strengthened for some reason (e.g., wet shoe print, sound of thunder), the presence or absence of other conditions make the response inappropriate (e.g., a clear sky).

In the present study, conditions that induced the subjects to assert the primary tact in response to the nonexamples in the first phase of the training included size and fill patterns that the nonexamples had in common with the generic examples, the fact that the nonexamples were presented in the same way and with the same verbal prompt as the generic examples, as well as the fact that the primary response was being reinforced and modeled by the trainer. In the presence of these irrelevant conditions, but in the absence of the defining feature of the symbol, the negation autoclitic *taka* was reinforced if it was accompanied by the name of the symbol that was being trained.
During the first phase of the training, subjects occasionally used the primary verbal behavior to describe the nonexamples. This indicates that the irrelevant features that these cards had in common with the generic examples were sufficient to strengthen the primary verbal behavior. The untrained nonexamples that were administered during the first generalization test, assessed the control of this autoclitic response form. All subjects responded correctly to the untrained nonexamples with respect to the first symbol tested, nam. With the introduction of additional symbols Subject 3 continued to respond correctly, but Subjects 1 and 4 made six and eight mistakes, respectively, on the 24 remaining response opportunities—(see Tables 7, 8, and 9). It is possible that these mistakes reflect to some extent the unclear general status of the negation autoclitic as studied in this research. To illustrate this point, Subject 1 once and Subject 4 three times gave the correct autoclitic, taka, but with an incorrect primary response. However, to say taka nam in response to one of the mo nonexamples is only incorrect because the generic examples being presented in the same session are mo examples rather than nam examples. In one sense such a response is correct. The example is not a nam example, and is thus taka nam. Subject 1 three times and Subject 4 once gave an incorrect primary tact without any autoclitic. For nam to evoked by one of the mo nonexamples is less accurate than taka mo, but more accurate than to say mo. Possibly for the moment the mo nonexample seemed somewhat like one of the 7 previously seen nam examples. Similarly for saying mo or nam in response to a ta nonexample.
As for the actual controlling variable for taka when it occurs correctly, it seems insufficient to point to the fact that the stimulus is not of a certain type. A molecular analysis might identify a common effect that such nonexamples have upon the speaker. For instance, when a subject is presented with a new trial during the first phase of the training, he may emit observing behaviors that are reinforced by seeing the features that strengthen the evocation of an appropriate primary tact. In the early stages of training, this observing behavior is likely to be relatively unsystematic because the contingencies have not extinguished control by irrelevant aspects of the stimulus. But with increased exposure to the contingencies, the subject may acquire a more effective sequence of observing behaviors related to only those features that are critical for the control of the primary verbal behavior. Observing one of the defining features of the visual stimulus may result in a subsequent defining feature becoming an effective form of reinforcement for further observing behavior. These behaviors are ultimately reinforced automatically because they permit the subject to engage in successful verbal behavior. Once this scanning behavior is well established, conditions are created for the subject to be affected by distortions in the visual stimulus that disrupt a smooth sequence of successful observing responses. It is possible that it is this disruption that comes to control taka, and possibly also zola.

During Phase III training on each of the first four symbols (no Phase III training occurred for do, the last symbol), the subjects were reinforced for correct responses to generic, metaphoric, and nonexamples of that symbol. Table 3 shows the
number of errors that occurred for each type of stimulus. At the beginning of the study, responses were only classified as correct or incorrect, and errors were not recorded as to type. However, error types are available for the last three symbols receiving Phase III training, the symbols nam, mo and ta. In general, the most common errors were the occurrence of taka when zola would have been appropriate for that primary response and zola when taka would have been appropriate. The former is to be expected in terms of the difficulty of the relevant discrimination. Being more strongly affected by the distortion in the metaphoric figure than by the features it has in common with the generic figure would result in taka instead of zola. The latter type of error is less understandable, and the prevalence of both errors suggests using only generic and nonexamples is not sufficient to train appropriate usage of the negation autoclitic. The training needs to incorporate metaphoric examples to further sharpen appropriate stimulus control. The same can be concluded for the training of the extension autoclitic. It too requires that the subject be exposed not only to generic and metaphoric examples, but also nonexamples.

Training and Generalization of the Extension Autoclitic

The results from this phase of the study address the main point of this research. Here was determined the extent to which untrained metaphoric examples of a symbol would evoke the metaphoric autoclitic, zola (trained with the previous symbol) in combination with the generic tact. For example, when the subjects were pre-
sented with the generalization probes for the symbol nam, they had never before seen a metaphoric example of that symbol, and they had never been reinforced for saying zola nam in response to such a stimulus.

As Tables 10, 11, and 12 show, the three subjects all eventually showed appropriate generalization of the extension autoclitic. However, compared to the negation autoclitic, this generalization did not occur until relatively late in the training. Moreover, when the generalization occurred, it was not complete. On the last symbol, Subject 1 showed generalization on only 4 out of the 8 trials, and Subject 3 and 4 showed generalization on 5 and 8 of the trials respectively. There are several factors that may have interfered with the acquisition and demonstration of appropriate generalization of the extension autoclitic.

First, the acquisition of the extension autoclitic required that the primary tact response be under much sharper control by the defining features of the symbol. There were significantly more stimulus features that distinguished a generic example from a nonexample than a generic example from a metaphoric example. Consequently, the nonexamples were likely to have provided the speaker with a much more salient controlling variable for the negation autoclitic than the metaphoric examples could furnish for the extension autoclitic. For the speaker to be affected by the metaphoric quality of the generalization probes, the primary verbal behavior needed to be under the precise control of the defining features of the symbol. If this control was defective in some way, the subject might not have been affected by the metaphoric distortion of
the defining feature, and as a result may have responded to the stimulus as a generic example. This is consistent with the way the subjects responded to the generalization probes of the first two symbols. As Tables 10, 11, and 12 show, the metaphoric stimuli most commonly evoked the correct primary response without any autoclitic.

Second, errors that Subjects 1 and 4 made on the generalization tests suggest that the training of previous symbols may have given the extension autoclitic excessive intraverbal control over the primary tact. For example, on the generalization tests for the third and the fourth symbol, Subject 1 made 7 errors that involved following the correct extension autoclitic with a primary response for a previously trained symbol. Instead of saying *zola ta* to a metaphoric example of *ta*, Subject 1 said *zola mo* which she had previously been trained to say to metaphoric examples of *mo*. The most likely explanation for this error is that while the metaphoric qualities of *ta* were able to evoke the extension autoclitic, *zola*, the intraverbal control that *zola* had previously acquired over *mo* was stronger than the control that the distorted *ta* had over the primary response *ta*. In other words, by acknowledging the metaphoric aspect of *ta*, Subject 1 may have inadvertently produced a stimulus that caused her to accompany it with an incorrect primary response. There is some evidence to suggest that inappropriate intraverbal control over the extension autoclitic may also have played a role in the Howard and Rice (1988) study. However, in that study the intraverbal control may have exaggerated the rate of autoclitic generalization because of the way the generalization was assessed. The study assessed generalization by interspersing
autoclitic probe trials during both the tact training condition, where only primary verbal behavior was trained, and the autoclitic training condition where only autoclitic verbal behavior was trained. If the autoclitic was controlled only by relevant properties of the primary verbal relation, it would be expected that the frequency of generalized autoclitic responding would be largely unaffected by the training condition where the generalization was assessed. For two of the subjects, however, most of the generalization was assessed in the autoclitic training condition. After the first tact training condition, both subjects showed significant generalization in the autoclitic training condition that followed. In a subsequent tact training condition, the rate of autoclitic generalization dropped markedly, but increased again significantly in the following autoclitic training condition. This fluctuation in the rate of autoclitic generalization suggests that the autoclitic response form may have derived additional strength from an extraneous variable that was present during the autoclitic training condition. In the autoclitic training condition, the autoclitic response form was consistently reinforced, not only in the presence of a stimulus card showing a distorted stimulus feature, but also in the presence of the trainer's verbal prompt in the beginning of a trial, "Can you tell me what this is?" As a result, it is possible that this verbal stimulus may have acquired control over the response during autoclitic training. So when the two subjects were confronted with a generalization probe during the autoclitic training condition, simply seeing the trainer hold up a card and hearing him say, "Can you tell me what this is?" may have been enough to strengthen and evoke
the appropriate autoclitic response.

Third, Subject 3 used the *taka* autoclitic four times to describe metaphoric examples of *ta* and *do* on the generalization tests. As was pointed out earlier, this could result from the subject being more strongly affected by the distortion in the generalization probe than by the feature it has in common with the generic examples of the same symbol. In that case, *taka* could be considered more appropriate autoclitic than *zola*.

A fourth factor that may have affected the training and demonstration of appropriate autoclitic generalization is the subjects’ previous language training history. The reason for training the subjects on nonconventional stimuli and response forms was to control as much as possible for the effects of previous language training. The stimulus material used by Howard and Rice (1988) consisted of colors, letters, and forms, which occupy a substantial part of many preschool curriculum. In response to this material, the subjects were trained on conventional English response forms that are likely to occur at a considerable frequency in their verbal community. This raised the possibility that the results could partly be attributed to an uncontrolled training history. For example, one subject in the Howard and Rice study emitted a generalized extension autoclitic prior to having received any formal autoclitic training by the experimenters.

It turned out that although the use of nonconventional stimuli and response forms may have succeeded in reducing the effects of previous verbal training on the
primary verbal behavior, it failed with respect to the extension autoclitic. Subjects’ responses to the untrained metaphoric examples on the generalization tests provided unexpected evidence for the generalization of conventional autoclitic response forms. During generalization testing, three subjects were recorded emitting different forms of conventional extension autoclitics accompanied by appropriate primary tact responses. For example, for Subject 3, the metaphoric examples of nam and mo repeatedly evoked “silly” and “cool” followed by the correct primary tact (e.g., ”This is a silly nam”). When shown an untrained metaphoric example of nam, Subject 4 said, “I knew this was nam because it looked like nam.” The absence of metaphoric extension was also noted by Subject 4 when, after having seen a series of metaphoric examples, he commented in response to a generic example of mo, “Finally got an easy mo.” Subject 2 seems to have been similarly affected when generic examples of nam evoked the responses “good” and “nice” (“Oh, what a nice nam”). The intrusion of conventional autoclitics during generalization testing is interesting for several reasons. First, it suggests that even though Subjects 2, 3, and 4 did not apply the nonconventional extension autoclitic during generalization testing on the first two symbols, the training had nevertheless been successful in imparting differential behavior to generic and metaphoric examples. In other words, these subjects did not give the same response to the metaphoric examples as they did to the generic examples simply because they were unaffected by the difference between them. Second, the conventional autoclitic repertoire appears to have been at considerable strength given that it was
never modeled or reinforced by the experimenter. Third, the repertoire is under the control of some general aspect of the primary tact relationship, that resulted in the novel distortion evoking that primary response form.

It is possible that the intrusion of the conventional autoclitic behavior may have impacted the training and evocation of the nonconventional extension autoclitic. One way in which the conventional autoclitic may have had an impact is by competing with the occurrence of the nonconventional autoclitic. It is possible that the nonconventional autoclitic did not appear earlier and with more frequency in the subject’s repertoire because of the occurrence of incompatible conventional autoclitics of greater strength. Aside from the fact that the subjects may have received substantial training on the conventional autoclitics, what may have contributed even further to their strength is the verbal prompt used by the experimenter. Although the prompt, “Can you tell me what this is?” may not strengthen any particular primary or secondary verbal behavior, its extensive history for setting the occasion for conventional verbal behavior may have been enough to override the nonconventional extension autoclitic. However, as the nonconventional extension autoclitic acquired more strength on subsequent training trials, and the conventional autoclitics weakened due to extinction, the nonconventional autoclitics become predominant. This explanation is consistent with the fact that once subjects started to emit the nonconventional autoclitic on the generalization test for the fourth symbol no further instances of conventional autoclitics were noted. Another way the conventional autoclitics could have
impacted the training is by entering into the control of the nonconventional autoclitic. If the nonconventional autoclitic response form has a history of being reinforced when descriptive autoclities such as “nice” and “like” are being emitted or strengthened by current stimulation, it is possible that the nonconventional autoclitic may have come under partial control of the conventional autoclities. In other words, the response form may come to be jointly controlled by a distortion in the metaphoric stimulus as well as the conventional autoclitic responses that are concurrently being strengthened by the same stimulation. In well trained speakers, a joint control of this sort is frequently described (tacted) with relational autoclities such as A means B or A and B mean the same thing. This sort of relational tacting is usually followed by an abrupt change in the behavior of the speaker (Catania, Matthews & Shimoff, 1982). Once the speaker has discovered that zola means “like,” the relational tact response in addition to current stimulation would set the occasion for saying zola. In other words, the speaker would now be reacting to two controlling variables instead of just one. Throughout the course of the experiment, no instances of this type of relational autoclitic responding were noted by the experimenter. Furthermore, no sudden changes in the rate of generalization were observed, suggesting that this type of responding did not occur.

Summary and Suggestions for Further Research

The purpose of this study was to examine the functional relation that Skinner
(1957) predicts exists between autoclitic tacts and the variables controlling primary verbal behavior. As previously discussed, autoclitis help the listener to interpret and react more effectively to the speaker's primary verbal behavior. Autoclitis provide the listener with stimuli related to the condition of the variables that control the speaker's primary verbal behavior; how the speaker is being affected by these variables; and the nature of the context where the primary verbal behavior occurs. Said differently, autoclitis answer questions like when, where, and why a particular verbal assertion was or will be made. Overall, the results of this study replicate and strengthen the essential findings of Howard and Rice (1988). First, the study confirmed the Howard and Rice data showing that normal preschool children can be trained to correctly emit a generalized extension autoclitic. The three subjects as shown in Tables 10, 11, and 12, all demonstrated appropriate generalization, although at a somewhat slower rate than the subjects in the Howard and Rice study. Their subjects began to show generalization after autoclitic training on only one concept, whereas in the present study the subjects did not show generalization until on the third symbol. Second, the study also showed that preschool children can be trained to correctly emit a generalized negation autoclitic. The results from the first generalization test shows that the children acquired this response with relative ease. Third, the fact that these results were obtained using nonconventional stimulus material and response forms, indicates that the critical variable for training generalized autoclitic responding is not the form of the autoclitic response, or the "meaningfulness" of the
stimulus material, but rather the systematic manipulation of the instructional material and the verbal contingencies.

Further research in this area of verbal behavior can go in several different directions. One line of research could examine more carefully the properties of the primary verbal relation and how these properties relate to the acquisition of extension autoclitics. Presumably, the primary verbal behavior needs to be under sharp stimulus control before the extension autoclitic can be acquired. Howard (personal communication) suggested that this relationship could be investigated further by manipulating the speed and accuracy—what Binder, Haughton and Van Eyk (1990) defined as fluency—of the primary verbal behavior and measuring the effect it has on the acquisition of the extension autoclitics.

In the present study conventional generic stimuli and response forms were avoided by the use of abstract or meaningless figures and nonsense or meaningless vocal responses. However, the general autoclitic relationship was the conventional one involving metaphoric extension (analogous to our "like"). A second line of research could involve an effort to teach an autoclitic that was controlled by some aspect of the primary response or of its relation to the speaker or listener that has no counterpart in ordinary language.

A third line of research could extend the generality of the findings in this study and that of Howard and Rice (1988) by using different types of stimulus material. Both studies used visual stimulus material, and although extension autoclitics are
frequently used to accompany primary responses that are controlled by such material, they also occur with primary responses that are controlled by other sources of stimulation, such as auditory stimulation (e.g., 'This sounds like') or tactile stimulation (e.g., 'This feels like').

A fourth line of research could study whether an extension autoclitic acquired under the control of the metaphoric extension of a primary response to a visual stimulus would without further training occur to primary responses that are controlled by different sensory stimuli. For example, to what extent can a child that has been trained to say 'like a square' in response to a metaphoric example of a visual square, say 'like the Beatles' in response to a song played by the Beach Boys? This type of generalization, if it occurred, would be very informative. Not only would it further support the hypothesis that the controlling variable for the extension autoclitic was the speaker's reaction to the primary verbal relationship, but it would also suggest that these reactions had a feature that was common among primary verbal relations that are controlled by different types of stimuli.
Appendix A

HISRB Proposal Approval Letter and Informed Consent Form
Date: September 10, 1995
To: Ingolfur Bergsteinsson
From: Richard Wright, Chair
Re: HSIRB Project Number 95-04-12

This letter will serve as confirmation that your research project entitled "The effects of combined autoclitic and tact training on verbal acquisition in children" has been approved under the full category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you must seek specific approval for any changes in this design. You must also seek reapproval if the project extends beyond the termination date. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: September 10, 1996

xc: Jack Michael., PSY
I understand that my child has been invited to participate in a research project entitled "The Effects of Combined Autoclitic and Tact Training on Verbal Acquisition in Children." The purpose of the study is to examine the development of language skills in normal children. I further understand that the purpose of this project is to fulfill Ingolfur Bergsteinsson's dissertation requirements.

My consent for my child to participate in this project means that my child will participate in language training where he/she will learn an artificial language with words like "taka" and "inni" to describe novel geometric figures. The training will rely on modeling where the trainer encourages the child to repeat with him what the right words are. The language training will be conducted at the preschool during regular school hours in cooperation with teachers and staff. The training will be conducted during 20-min. sessions. For the completion of the study, it is estimated that the subject will have to participate in approximately 35 sessions. However, no more than 4 sessions will be scheduled each week.

The youngsters in the study are free at any time—even during the study—to choose not to participate. If my youngster refuses or quits, he/she will not have to suffer any negative effects, like unfriendliness, or lack of interest from the experimenter, or the teachers at the preschool. In other words, the child will receive the same quality of care and instruction as he/she enjoyed before participating in the experiment.

I also understand that all training data and information will remain confidential. That means that my youngster's name will be omitted from all data forms and code number will used instead. A separate list of all the youngster's names and corresponding codes will be kept in a locked file. This list will be destroyed when the study is completed. No names will be used if the results are published or reported at a professional meeting.

I understand that the only risks anticipated are minor frustration or boredom during training. As in all research, there may be unforeseen risks to my youngster. If an accidental injury occurs, appropriate emergency measures will be taken; however, no compensation or treatment will be made available to me except as otherwise specified in this consent form.

I understand that I may also withdraw my child from this study at any time without any negative effect on my youngster. If I have any questions or concerns about this study, I may contact either Ingolfur Bergsteinsson at (510) 254-2707 or Jack Michael at (616) 387-4464. I may also contact the Chair of Human Subjects Institutional Review Board at (616) 387-8293 or the Vice President for Research (616) 387-8298 with any concerns that I have.

My signature below indicates that I give my permission for ______________________________ (younger's name) to participate in the language training and for the results to be released to me for this research.

______________________________  __________________________
Signature                     Date
Appendix B

Stimulus Material
Generic Examples of Ki Used in Phase I Training
Nonexamples of Ki Used in Generalization Test I and Phase III Training
Generic Examples of Mo Used in Generalization: Test I and Phase II and III Training
Metaphoric Examples of Mo
Nonexamples of Mo Used in Phase I Training

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Nonexamples of Mo Used in Generalization Test I and Phase III Training
Generic Examples of Ta Used in Generalization Test I and Phase II and III Training
Metaphoric Examples of Ta
Nonexamples of Ta Used in Generalization Test I and Phase III Training
Generic Examples of Do Used in Generalization Test I and Phase II Training
Metaphoric Examples of Do
Nonexamples of Do Used in Phase I Training
BIBLIOGRAPHY


