

# Establishing Equivalent Intraverbal Relations

*Establecimiento de relaciones intraverbales equivalentes*

Philip N. Chase and Abdulrazaq A. Iman

West Virginia University  
Morgantown WV.

## *EQUIVALENT INTRAVERBAL RELATIONS*

### ABSTRACT

This study applied the stimulus equivalence model to learning intraverbals, and found that for adult subjects the model is sufficient for predicting the occurrence of other intraverbal relations, novel for the subjects. The relation between studies of verbal relations and those studies that show that nonverbal organisms have difficulties learning equivalent classes, suggest that analysis of verbal relations ought to include infants and other nonverbal organisms as subjects in order to reveal the necessary and sufficient conditions for learning verbal equivalence classes.

DESCRIPTORS: stimulus equivalence, intraverbals.

### RESUMEN

*Este estudio emplea el modelo de equivalencias de estímulos para el aprendizaje de intraverbales, encontrando que el modelo es suficiente para predecir la ocurrencia de relaciones intraverbales nuevas, con sujetos adultos. La relación entre los estudios acerca de las relaciones verbales, con aquellos estudios que muestran que los organismos no verbales tienen dificultades al aprender clases equivalentes, sugiere que el análisis de las relaciones verbales debe incluir entre los sujetos a niños pequeños y a otros organismos no verbales, para esclarecer cuales son las condiciones necesarias y suficientes para el aprendizaje de clases de equivalencia verbales.*

DESCRIPTORES: equivalencia de estímulos, intraverbales.

Skinner (1957) describes a number of primary classes of verbal behavior including the mand, tact, intraverbal, transcriptive, echoic, autoclitic and textual. For instance, Skinner defined the intraverbal as verbal behavior con-

Table 1

Six intraverbal relations used during testing.

- 
1. Name—Example (AB): Identify examples when given a name of a concept.
  2. Name-definition (AC): Identify definitions when given a name of a concept.
  3. Example-name (BA): Identify names when given an example of a concept.
  4. Definition-name (CA): Identify names when given a definition of a concept.
  5. Example-definition (BC): Identify definitions when given an example of a concept.
  6. Definition-example (CB): Identify examples when given a definition of a concept.
- 

example 1 might be considered correct for the concept name of abulia and example 2 would be considered incorrect. However, if the same two examples were presented with the concept phrase, maintenance of behavior, example 1 would be considered incorrect and example 2 would be correct. Finally, these

Tabla 2

An example of the matching-to-sample tasks used during training and testing. This particular example presents a name-example (AB) question for the concept abulia.

---

Select the example that best matches the concept named.  
abulia

1. Jake appeared in twelve movies in the three years that he was under contract with Wolf Picture, Inc. After each movie Wolf would send him on a promotional tour and he would appear on at least ten talk shows. When his contract expired, however, he continued to make movies with Wolf, but they no longer sent him on promotional tours. Since that time Jake has appeared in three movies in two years.
  2. Jake appeared in twelve movies in the three years that he was under contract with Wolf Pictures, Inc. After each movie Wolf would send him on a promotional tour and he would appear on at least ten talk shows. When his contract expired, however, he continued to make movies with Wolf, but they no longer sent him on promotional tours. Since that time Jake has appeared in eight movies in two years.
-

trolled by verbal stimuli where the behavior and the stimuli do not have point-to-point correspondence. Thus, a student's answer to a teacher's question would be an intraverbal. Skinner claimed that these classes were functionally independent and subsequent studies have demonstrated that the echoic (Boe & Winokur, 1978), the mand and the tact (Hall & Sundberg, 1987; Lamarre & Holland, 1985) and various forms of the intraverbal (Chase, Sulzer-Azaroff & Johnson, 1985) were independent operant classes.

Chase et al. (1985) found that teaching subjects to engage in one kind of intraverbal was not sufficient for subjects to engage in other kinds of intraverbals even when the content of the intraverbal relations was the same. Specifically, when subjects were taught to identify written examples of a concept, they could not necessarily write definitions or examples of the same concept. In addition, if subjects were taught to write examples or definitions, they could not accurately identify examples of the same concept. Subjects had to be taught directly to engage in the identification, definition and exemplification of intraverbals.

Casual observation of human verbal relations, however, indicates that such transfer occurs frequently. We often learn to speak about events in classrooms and then identify these events in our lives. In addition, our behavior as instructors often involves teaching students to engage in many kinds of verbal behavior without explicitly teaching each and every form with each and every concept. Thus, the question that we need to answer is what variables affect transfer across classes of verbal behavior.

One model of transfer or extension that has been successful in other contexts is the stimulus equivalence model. This model involves the use of conditional discrimination procedures to generate equivalence relations or interchangeability among stimuli (Sidman & Tailby, 1982; Lazar, et al., 1984). An equivalence relation is defined by its reflexive, symmetric and transitive properties (Sidman & Tailby, 1982; Sidman, Rauzin, Lazar, Cunningham, Tailby & Carrigan, 1982). To demonstrate reflexivity, generalized identify matching is required, whereby a subject selects a comparison stimulus given itself as a sample, in the manner of "if a, then a", or "if b, then b". To demonstrate symmetry the subject must show sample-comparison reversibility. That is, the subject selects a comparison stimulus b, given the sample a, and the comparison stimulus a, given the sample b. This yields the relations, "if a, then b" and "if b, then a". Transitivity involves the relations among three stimuli a, b, and c such that if the subject selects comparison stimulus b given sample stimulus a, and comparison stimulus c given sample b, and comparison c given sample a, then transitivity is demonstrated.

Stimulus equivalence is a model of transfer because it predicts that directly training a few conditional relations among stimuli will result in a number of other relations emerging without direct training. For example, we first assure that a reflexive relation has been demonstrated, a child selects 'dog' when the sample is 'dog' and 'cat' when the sample is 'cat'. Then, if we teach the selection of a picture of a dog when given the word 'dog', and a picture

of a cat when shown the word '*cat*', the child should select the sample '*dog*' when given the picture of the dog and the word '*cat*' when shown the picture of the cat without direct training (symmetrical relations). Further, if we teach the selection of a live dog and a live cat in the presence of '*dog*' and '*cat*' respectively, the child should select the picture of a dog when shown a live dog and the picture of a cat when shown a live cat, and the live dog and live cat when shown their pictures (transitive relations). Thus, in this example two conditional relations were taught directly and four emerged without direct training.

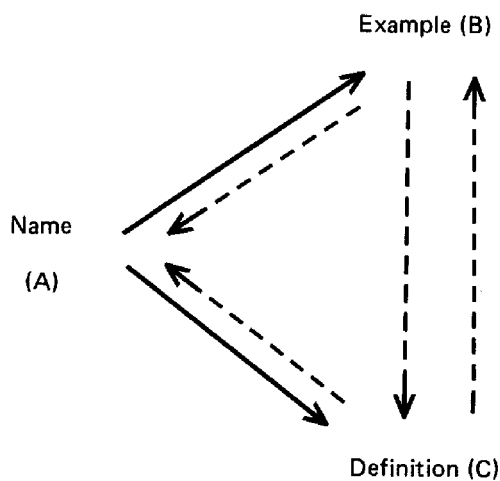
Several studies have demonstrated the formation of equivalent stimuli through conditional discrimination procedures. These procedures have been used to teach relations among stimuli to retarded teenagers (Sidman & Cresson, 1973; Spradlin, Cotter & Baxley, 1973; Stromer & Osborne, 1982), normal children (Sidman & Tailby, 1982; Lazar, Davis-Lang & Sanchez, 1984) and normal adults (Lazar, 1977; Sidman, Kirk & Willson-Morris, 1985, Experiment 2). The model has been shown to be economical in terms of the limited amount of training required to establish emergent performance that would otherwise not have been achieved. Along with the success of the model, questions have been raised about its applied generality and efficacy, particularly as these relate to linguistic or verbal behavior. The present study was designed to consider some preliminary issues in applying the model to transfer or stimulus control across classes of verbal relations.

The model was applied to intraverbal relations similar to those manipulated by Chase et al. (1985). Definitional intraverbals involved providing the subjects with either a name or an example of a concept and asking them to select the correct definition from a list of definitions (name-definition and example-definition respectively). Example identification intraverbals involved providing the subjects with a name or definition of a concept and asking them to select the correct example from a list of examples (name-identification and definition-identification respectively). A new type of intraverbal, the naming intraverbal, involved presenting the subject with either an example or a definition of a concept and asking the subjects to select the correct name from a list of names (example-name and definition-name respectively). These intraverbals were further analyzed into six specific conditional relations. Table 1 presents these relations and their definitions.

In addition to these relations being classified as intraverbals they also were conceptual relations. The examples and definitions used in each type of relations were novel from trial to trial, thus subjects were asked to respond to novel stimuli in similar ways. This is true for many verbal relations that occur in normal discourse for it is rare that people provide the exact same examples or definitions of concepts from conversation to conversation. The relations that we devised simulated this aspect of normal discourse.

These relations were then conceptualized procedurally as conditional stimuli that could be taught via conditional discrimination procedures. Table 2 presents an instance of the matching-to-sample tasks used. In this instance,

conditional relations were arranged into the now familiar stimulus equivalence triangle to determine the minimum training needed to facilitate transfer to all possible relations between the stimuli. Figure 1 presents this arrangement. Notice that the solid arrow indicates the minimum training that should be required in order to learn all the relations among these stimuli (the combination of solid and dashed arrows).



**Figure 1:** The stimulus equivalence model for name, definition and example stimuli. Solid arrows indicate the conditional relations trained and the dashed arrows indicate the conditional relations tested.

The specific experimental question was whether subjects taught the two conditional relations specified by the solid arrows in Figure 1 (name-example and name-definition) will be able to correctly engage in the symmetrical and transitive relations indicated by the dashed arrows (example-name, definition-example and example-definition). Alternatively, if they are provided with training on only one of these relations (name-example) will they be able to engage in the other relations? In addition, the question addressed whether these conditions were sufficient to produce transitive and symmetrical relations with conceptual stimuli.

## Method

### *Subjects*

Seven college undergraduates served as subjects. Subjects were recruited from an introductory psychology class. Their ages ranged from 18-22 years and they were freshmen or sophomores in college. None of the subjects reported having any experience as subjects in a human experiment and only one subject (Subject 1) reported having any experience with behavior analysis. These subjects were selected from an original group of ten subjects. Two subjects were eliminated from the study because they failed to obtain mastery of the verbal relations taught during the training sessions. A third subject was eliminated from the study because he repeatedly missed the scheduled test session.

### *Personnel*

Two undergraduate psychology majors conducted the experimental sessions, corrected the tests, helped compute the data, transcribed audio tapes of the experimental sessions, checked the reliability of implementing the experimental procedures and rescored the transfer tests in order to calculate indices of agreement. Training for all assistants was identical to that reported by Chase et al. (1985).

### *Setting*

The experimental sessions took place in a small sound insulated room. The room was equipped with a desk, two chairs and shelves for experimental materials. A one-way mirror allowed the first author to observe interactions between the assistants and subjects.

### *Materials and Apparatus*

The experimental materials included two prose passages, each of which defined an esoteric psychological concept (abulia and tau effect). These concepts were selected from a pool of 12 concepts because previous subjects had responded similarly to items for each. Chase et al. (1985) presented an extensive description of this testing. For each concept a set of questions were selected from a pool of items that had been previously tested for level of difficulty (Chase et al., 1985). These included a transcriptive task and the six kinds of matching-to-sample questions described previously: name-

example, name-definition, example-name, example-definition, definition-name and definition-example.

Other materials included a pretest, a scoring sheet and outlines which provided guidelines for conducting each experimental session.

Cassette tapes were used to record all interactions between assistants and subjects. The experimenter listened to the taped interactions to check the reliability with which the procedures were implemented.

An electric timer also was provided for each carrel. The assistants timed and recorded the duration spent by each subject on each task.

### *Procedures*

The study was conducted with each subject during five, one hour sessions. The first session was devoted to pretesting whether the subjects could answer questions on the concepts abulia and tau effect. The pretest included questions on each of these two concepts and some prerequisite concepts. Prior to the administration of the pretest the subjects were told that they would receive ten cents for every correct answer, however, no consequences were delivered during the pretest.

During the second through fourth session, the subjects received two kinds of training. For one concept the subjects received repeated training on one verbal relation, name-example (AB training). For a second concept the subjects received training on two verbal relations: name-example and name-definition (AB, AC training). Training was counter balanced across subjects. Three subjects received AB training with abulia, and AB, AC training with tau effect. The other four subjects received AB training with tau effect, and AB and AC training with abulia. Table 3 presents this design.

During each session, the general format was as follows: First, subjects read a prose passage that defined a concept. Second, the subjects were told to fill in the blanks of the transcriptive task word-for-word from the passage. This was done to assure that subjects read the material. On completion of the task, the assistant immediately corrected it. If there were any mistakes, the subjects were asked to read the passage again and correct all mistakes. If there were no mistakes, the subjects were given a dime. Next, the series of questions was presented for the specific program that was assigned for that session. For example, during AB training subjects received eight name-example questions for abulia and eight name-example questions for tau effect. Each correct and incorrect comparison was new for the subject for each question (see Table 2 for an example of an AB question). Specific detailed feedback based on a prepared answer key was given for each answer. If the answer was correct, the subjects were told why and given a dime. If the answer was incorrect, the subject was told why, but not given a dime. Each task was timed separately. These procedures were followed until the subjects completed the study sequence.

Table 3

The experimental design showing the sequence of relations trained and tested

Subjects	Concepts	Training			Test
		Session 2*	Session 3	Session 4	Session 5
1, 4, 5	Abulia	AB	AB	AB	All six.
	Tau Effect	AB	AC	AB, AC	All six.
2, 3, 6, 7	Tau Effect	AB	AB	AB	All six.
	Abulia	AB	AC	AB, AC	All six.

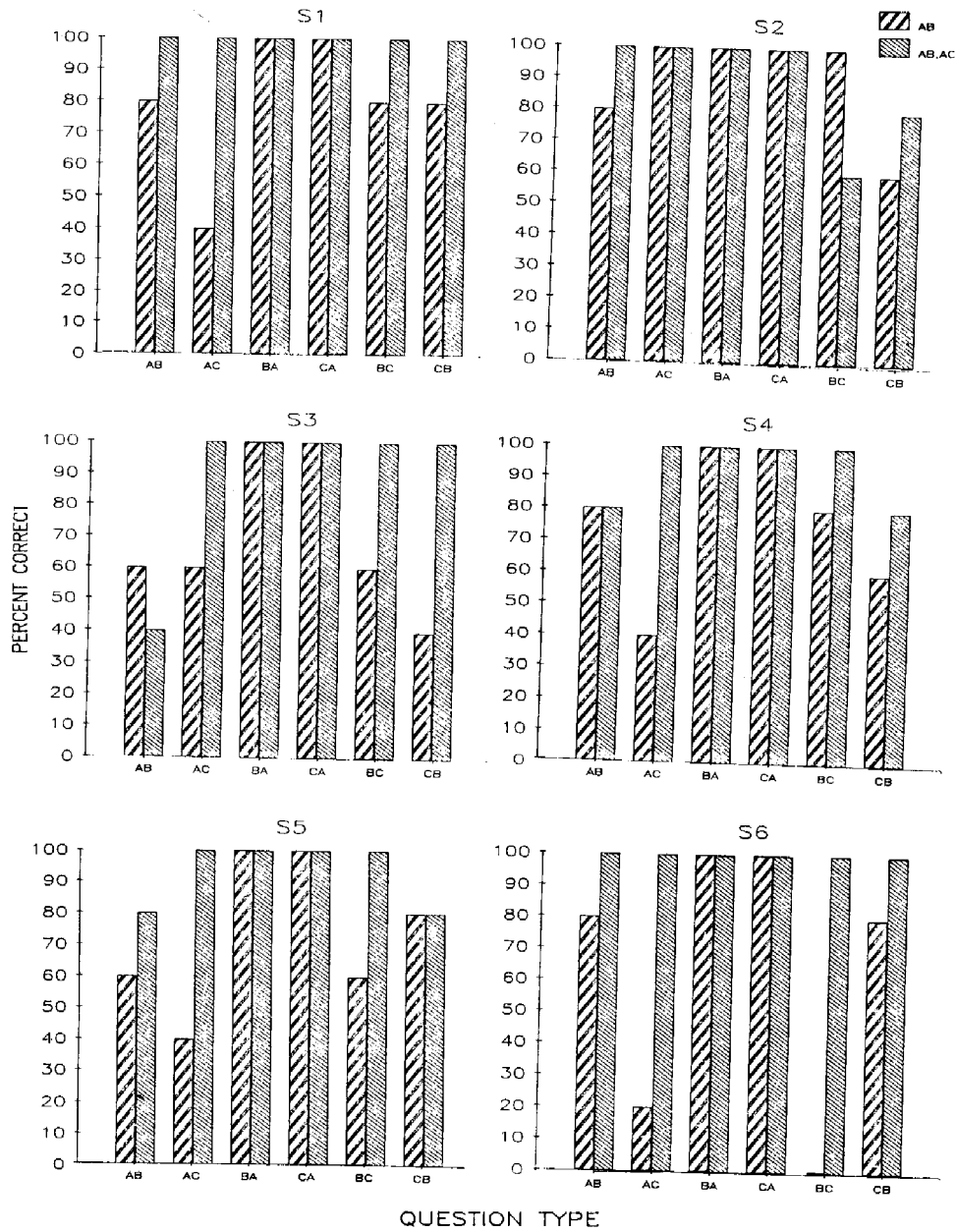
\* Session 1 was the pretest for all subjects.

After three sessions of training and greater than 90% accurate performance on the training questions for both concepts, the subjects were tested on all six relations specified in Table 1 for each concept. The test consisted of forty-four questions divided equally between questions for abulia and questions for tau effect. For each concept there were five AB questions, five AC questions, five BC questions, five CA questions, one BA question and one CA question. All examples and definitions used as comparisons were new for the subjects. In addition, monetary consequences were *not* delivered during the test.

### Results

Figure 2 presents the percent correct performance on the six tested relations for six subjects. AB refers to name-example questions, AC refers to name-definition questions, BA refers to example-name questions, CA refers to definition-name questions, BC refers to example-definition question and CB refers to definition-example questions. These data were generally consistent with the stimulus equivalence model. First, most subjects accurately answered the questions for which they had received training. Five of the seven subjects maintained eighty percent or better correct performance on the AB questions for both concepts and all seven subjects maintained one hundred





**Figure 2:** Percent correct performance on the six tested relations for all subjects. AB is name-example, AC is name-definition, BA is example-name, CA is definition-name, BC is example definition and CB is definition-example.

percent correct performance on the AC questions on the concept for which they received AC training. Second, when subjects did *not* receive training on AC questions they generally did not answer these questions accurately, only two subjects performed at eighty percent correct on the AC questions for the concept that had been trained only with AB intraverbals. Third, the transitive type test questions, BC and CB, were answered more accurately for the concept which had been trained with both AB and AC questions. Five subjects answered BC questions more accurately after AB and AC training, and five subjects answered CB questions more accurately after AB and AC training. Only one subject answered both types of transitive questions at one hundred percent accuracy after AB training only, and one other subject answered the BC questions at one hundred percent accuracy after AB training only.

The results also revealed some unexpected outcomes. First, without explicit AC training, all subjects responded at one hundred percent accuracy on the definition-name symmetry questions. Second, a number of subjects responded at eighty percent accuracy on other items that involved definitions in the conditional relation without explicit training with definitional stimuli. For example, subject 1 had eighty percent correct performance on both BC and CB questions. Third, subject seven was able to obtain one hundred percent correct performance on all symmetry and transitivity trials without explicit AC training on one of the concepts.

### Discussion

The current study was undertaken in order to test the robustness of the stimulus equivalence model to account for conditional relations that exist among natural language phenomena. We selected a type of natural language event that heretofore was considered an anomaly for a behavior analytic account of human behavior. Yet the results indicated that complex and seemingly novel verbal relations can be accounted for by the conditioning histories provided by the stimulus equivalence model.

The experiment revealed that when subjects learned to answer questions that involved the relation between the names and examples of concepts, and the names and definitions of the concepts, the subjects accurately completed tasks involving all six possible conditional relations that exist for these stimuli. However, when the subjects were not given this history, they did not perform all six relations accurately. These results support the use of the stimulus equivalence model to predict performance on different kinds of intraverbal tasks. They also extend the results of the stimulus equivalence model to intraverbal tasks that involve conceptual relations. The specific stimuli used for both definition stimuli and example stimuli were always novel to the subjects across trials. Thus, not only was equivalence class membership extended to specific sample-comparison relations not previously taught, but also to new instances of examples and definitions that the subjects had not seen previously.

The results also revealed some relations that were inconsistent with predictions made from the stimulus equivalence model. Subjects answered some of the questions that the stimulus equivalence model would predict they would not answer. However, there are at least three variables that might account for these data. Subjects were trained on both concepts with prose passages that provided detailed definitions of the concepts. Although the subjects only had to respond to a transcriptive question on the passages, they were exposed to definitional stimuli in both conditions and may have learned the definitions by copying them. Also, all subjects were exposed to both training conditions and there may have been some transfer of learning across concepts. Finally, the accurate performance on the symmetrical questions may have been due to the subjects being exposed to only two concept names, *abulia* and *tau effect*, during training. As the definitions of these concepts were very different from each other, the subjects, even under incomplete stimulus control, would be able to select one name as opposed to the other.

Other methodological concerns may limit the comparison of these findings to other stimulus equivalence research. The study was not designed according to the standards that have been discussed for stimulus equivalence research (Fields, Verhave & Fath, 1984; Sidman and Tailby, 1982). First, no attempt was made to eliminate the possibility of control by the incorrect comparisons during testing. All questions that used examples and definitions as comparisons involved both correct and incorrect comparisons that were novel. However, the degree of novelty was never assessed. It is difficult, therefore, to determine whether the incorrect comparisons were systematically more novel than the correct comparisons. If they were, then the responding could have been controlled by the incorrect comparisons because they were more novel (Carter and Werner, 1978; Fields, Verharve & Fath, 1984) or because they had not been involved in reinforced questions during training (Fields, Verharve & Fath, 1984).

Second, there was no reinforcement during the test trials and the probability of reinforcement had not been systematically decreased over training sessions. Therefore, the test conditions were essentially extinction conditions and some of the inaccurate performance may have been due to extinction effects (Sidman and Tailby, 1982). However, given other findings this seems unlikely. Since none of the trials were reinforced we would not expect any systematic findings due to type of training if extinction was in effect. In other words, if responding was under true extinction, the subjects would have made a comparable number of errors on AB and BA questions as they did on AC, CB and BC questions and would have made a comparable number of errors after AB training as AB and AC training.

Future research on the use of the stimulus equivalence model to account for transfer of learning intraverbal relations should be designed to minimize these limitations. It should be a simple matter to teach verbal classes which did not involve conceptual responding. In which case, the names, examples

and definitions should be standardized, and training and testing procedures should eliminate control by incorrect comparisons for the names, examples and definitions. First, we should assure that each stimulus used in the test has been presented before. Second, we should assure that each stimulus has a neutral reinforcement history. This can be achieved by having an equal number of questions in which the definitions, names and examples are used as the correct comparison as they are used as incorrect comparisons. Thus, what makes a stimulus a correct comparison is the particular sample with which it is paired. In addition, future research should eliminate exposure to the prose definitions and should test separate subjects on the two kinds of training to eliminate the control that these histories might engender.

These results indicate that the stimulus equivalence model does provide a sufficient description of the conditions necessary for adult verbal subjects to learn new verbal relations. The results also suggest further refinements in the description of the stimulus equivalence model as well as experiments that should be conducted in order to further test the application of the model to the development of verbal skills.

Up to this point most of the literature on stimulus equivalence has discussed the relations among stimuli in an equivalence class as stimuli that have the same "meaning" or effect on the subject (Sidman et al. 1982). The use of stimulus equivalence in this way suggests that the model is a model for accounting for the similar effect that physically dissimilar stimuli can have on individual behavior. Although the stimulus equivalence model does seem to account for such relations, it appears that it might also be an accurate description of relations among stimuli that are categorized in other ways. Hayes (1986) has suggested that the model also can be extended to relations among opposites and the relations that resulted from the experiments reported here indicate that other kinds of conditional relations may also be accounted for by the model.

In this experiment the subjects were taught that three kinds of stimuli were related to each other, names, examples and definitions of concepts. Though it is possible to claim that the relations among these stimuli are relations of sameness, we think that it would be best to describe these as conceptual "go with" relations. The relations are conceptual because there was a class of examples and a class of definitions to which the subjects responded. These relations are characterized as "go with" because a particular name "goes with" particular examples and definitions, and particular examples "go with" certain definitions. Thus, not only do the results support the previous findings that the stimulus equivalence model describes the conditions under which adult verbal subjects learn the relations among sets of stimuli, but the results indicate that these relations can take forms different from the sameness form that has been investigated previously.

The literature on stimulus equivalence with nonverbal organisms raises another issue that must be addressed in order for the stimulus equivalence model to account for the history of experiences that the subject needs in

order to respond to complex relations. These studies have revealed that simply teaching the two critical conditional relations is not sufficient in order to obtain equivalent classes (D'Amato, Salmon, Loukas, & Tomie, 1985; Lowe, 1986; Sidman et al. 1982; McIntire, Cleary, & Thompson, 1987). These studies imply that adult verbal subjects have had other critical conditioning histories that might contribute to their learning equivalence classes. Therefore, in order to study the sufficient conditions for the development of equivalence classes it will be necessary to study nonverbal subjects. This conclusion has special relevance to the study of verbal relations because many of the classic problems in understanding verbal behavior have to do with the acquisition of verbal skills by infants (cf. Brown, 1973; Rondal, 1985). If, as Lowe has indicated, preverbal infants do not learn equivalent relations when trained to engage in the critical conditional relations and many verbal relations involve equivalence classes, then the study of infant language acquisition will require isolating the other conditions that are required for equivalence classes to emerge.

In conclusion, the study reported here applied the stimulus equivalence model to learning intraverbals and found that for adult verbal subjects, the model was sufficient for predicting the occurrence of other intraverbal relations that were novel for the subjects. In addition, the study of complex verbal relations suggests additional questions that need to be addressed. The relation between studies of verbal relations and those studies that have shown that nonverbal organisms have difficulty learning equivalent classes suggests that studies of verbal relations ought to include infants and other nonverbal organisms as subjects in order to reveal the necessary and sufficient conditions for learning verbal equivalence classes. These suggestions for future directions are consonant with the general approach that we have used for investigating stimulus equivalences. We selected a problem that was difficult to explain from a behavioral perspective and tried to see whether the concepts of the stimulus equivalence model would help us predict the results. The results were positive and indicate that designing studies that investigate problems that are as complex as the phenomena we are trying to explain is a fruitful enterprise. We believe that such studies are necessary if behavior analytic descriptions are to be applied to understanding human behavior.

## REFERENCES

- Boc, R. & Winokur, S. (1978). A procedure for studying echoic control in verbal behavior. *Journal of the Experimental Analysis of Behavior*, 30, 213-217.
- Brown, R. (1973). *A First Language*. Cambridge, MA: Harvard University Press.
- Carter, D. E. & Werner T. J. (1978). Complex learning and information processing by pigeons: A critical analysis. *Journal of the Experimental Analysis of Behavior*, 29, 565-601.
- Chase, P. N. & Danforth, J. (In press). The role of rules in conceptual learning. In Parrott, L. K. & Chase, P. N. *Dialogues on Verbal Behavior*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Chase, P. N., Sulzer-Azaroff, B., & Johnson, K. R. (1985). Verbal relations within instruction: Are there subclasses of the intraverbal? *Journal of the Experimental Analysis of Behavior* 43, 301-313.

- D'Amato, M. R., Salmon, D. P., Loukas, E., & Tomic, A. (1985). Symmetry and transitivity of conditional relations in monkeys (*Cebus apella*) and pigeons (*Columba livia*). *Journal of the Experimental Analysis of Behavior*, *44*, 35-47.
- Fields, L., Verhave, T., & Fath, S. (1984). Stimulus equivalence and transitive associations: A methodological analysis. *Journal of the Experimental Analysis of Behavior*, *42*, 143-157.
- Hall, G. & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior*, *5*, 41-53.
- Hayes, S. C. (1986). The case of the silent dog-Verbal reports and the analysis of rules: A review of Ericsson and Simon's 'Protocol Analysis: Verbal Reports as Data'. *Journal of the Experimental Analysis of Behavior*, *45*, 351-363.
- Lamarre, J. & Holland, J. (1985). The functional independence of mands and tacts. *Journal of the Experimental Analysis of Behavior*, *43*, 5-19.
- Lazar, R. (1977). Extending sequence-class membership with matching to sample. *Journal of the Experimental Analysis of Behavior*, *27*, 381-392.
- Lazar, R., Davis-Lang, D. & Sanchez, L. (1984). The formation of visual stimulus equivalences in children. *Journal of the Experimental Analysis of Behavior*, *41*, 251-166.
- Low, C. F. (1986, May). *The Role of Verbal Behavior In the Emergence of Equivalence Classes*. Paper presented at the annual meeting of the Association for Behavior Analysis, Milwaukee, WI.
- McIntire, K. D., Cleary, J. & Thompson, T. (1987). Conditional relations by monkeys: Reflexivity, symmetry, and transitivity. *Journal of the Experimental Analysis of Behavior*, *47*, 279-285.
- Rondal, J. A. (1985). Social behaviorism and the interpersonal determinants of language acquisition. *International Newsletter of Social Behaviorism*, *4*, 2-21.
- Sidman, M., & Cresson, O. (1973). Reading and crossmodal transfer of stimulus equivalences in severe retardation. *American Journal of Mental Deficiency*, *77*, 515-523.
- Sidman, M., Kirk, B., & Willson-Morris, M. (1985). Six member stimulus classes generated by conditional-discrimination procedures. *Journal of the Experimental Analysis of Behavior*, *43*, 21-42.
- Sidman, M., Rauzin, R., Lazar, R., Cunningham, S. Tailby, W., & Carrigan, P. (1982). A search for symmetry in the conditional discriminations of rhesus monkeys, baboon, and children. *Journal of the Experimental Analysis of Behavior*, *37*, 23-44.
- Sidman, M. & Tailby, W. (1982). Conditional discrimination vs. matching to sample: An expansion of the testing paradigm. *Journal of the Experimental Analysis of Behavior*, *37*, 5-22.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Centry-Crofts.
- Spradlin, J. E., Cotter, V. W., & Baxley, N. (1973). Establishing a conditional discrimination without direct training: A study of transfer with retarded adolescents. *American Journal of Mental Deficiency*, *77*, 556-566.
- Stromer, R., & Osborne, J. G. (1982). Control of adolescents' arbitrary matching-to-sample by positive and negative stimulus relations. *Journal of the Experimental Analysis of Behavior*, *37*, 329-348.