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TRANSFER OF CONTEXTUAL STIMULUS FUNCTION VIA EQUIVALENCE CLASS DEVELOPMENT

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In a conditional discrimination, 6 college students arranged six Cyrillic letters into groups of three based upon which of two additional Cyrillic letters (contextual stimuli) was present. All subjects demonstrated symmetry and transitivity within each class of equivalent stimuli. In a second conditional discrimination, two more Cyrillic letters were related to each contextual stimulus. Testing of symmetrical and transitive relations between the original contextual stimulus and the two new ones confirmed the development of two three-member classes of contextual stimuli. Subsequent tests demonstrated that the new contextual stimuli controlled the previously trained sample-comparison relations for all subjects.

Key words: stimulus classes, stimulus equivalence, contextual control, matching to sample, conditional discrimination, button press, adults

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Sidman (1986) established a theoretical base with which to analyze interrelations of conditional relations. First, he extended the three-term contingency (i.e., stimulus–response–reinforcement) to four terms (i.e., stimulus–stimulus–response–reinforcement) in order to describe conditional discriminations. At least four four-term contingencies define the minimal arrangement for a conditional discrimination: (a) if Stimulus A1 occurs, then a response to Stimulus B1 is reinforced, whereas (b) a response to Stimulus B2 does not lead to reinforcement; (c) if Stimulus A2 occurs, then a response to Stimulus B2 leads to reinforcement, whereas (d) a response to stimulus B1 does not lead to reinforcement. The conditional discrimination is the fundamental unit for the functional description of a stimulus class (Sidman, 1986).

One way that stimulus classes are formed is by relating pairs of stimuli in conditional discriminations, such that each member of the pair serves a common function. For example, if a response to B1 is reinforced in the presence of A1, a stimulus–stimulus relation or two-stimulus relation (A1B1) results (Fields, Verhave, & Fath, 1984). If a response to C1 is reinforced in the presence of A1, the two-stimulus relation A1C1 results. The existence of the separate two-stimulus relations A1B1 and A1C1 provides the condition from which a two-stimulus relation between B1 and C1 can emerge without further training. If testing shows the presence of the two-stimulus relation B1C1 without direct training, it is called a *transitive relation* (Sidman & Tailby, 1982). Although the relation B1C1 is transitive, it is not possible to conclude the existence of a class of equivalent stimuli (i.e., A1 = B1 = C1) without meeting two additional conditions. A1, B1, and C1 constitute a class of equivalent stimuli only if the properties of *reflexivity* and *symmetry* are met in addition to transitivity (Sidman & Tailby, 1982). Reflexivity is demonstrated when the subject can engage in generalized matching to sample. For instance, having been trained to select A1 in the presence of A1, and B1 in the presence of B1, the subject selects C1 in the presence of C1 without further training. Symmetry is demonstrated when, having been trained to select B1 in the presence of A1, the subject selects A1 in the presence of B1 without further training.

Next, Sidman (1986) theorized that classes of conditionally related stimuli could themselves be under stimulus control. Conceptually this requires a five-term contingency (i.e., stimulus–stimulus–stimulus–response–reinforcement). The stimulus control in a five-term contingency, that is, the control by a conditional stimulus of a set of conditional relations, correct conditional responses to which are de-

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pendent upon its presence, has been labeled *contextual control* (Sidman, 1986). Placing the four-term contingency under further stimulus control results in a hierarchy of conditional discriminations (Sidman, 1986).

Panel 1 of Figure 1 depicts the minimal conditions for a contextually controlled conditional discrimination. If the Cyrillic letter designated X1 is present as a contextual stimulus, then the subject matches B1 and C1 to A1 and B2 and C2 to A2. However, if the Cyrillic letter designated X2 is present as a contextual stimulus, then B2 and C2 are matched to A1 and B1 and C1 are matched to A2. (We have chosen to depict just the possible two-stimulus relations in Figure 1. To depict each of the possible trial types, i.e., contextual stimulus–sample stimulus–correct comparison stimulus–and two incorrect comparison stimuli, would have tripled the space required.)

The establishment of contextual control has been demonstrated by a number of authors (Bush, Sidman, & de Rose, 1989; Fucini, 1982; Hayes, Devany, Kohlenberg, Brownstein, & Shelby, in press; Lazar & Kotlarchyk, 1986; Serna, 1987; Wulfert & Hayes, 1988). In each case, single contextual stimuli controlled each group of conditional discriminations. Logically, it makes sense to consider that a class of stimuli can be formed at the fifth-term level that will control subordinate conditional discriminations as do single contextual stimuli. There is nothing in Sidman's (1986) model that suggests this should not be the case. However, this has not been demonstrated empirically. A simple extension of the procedures normally used to establish classes of equivalent stimuli at the fourth-term level should suffice (e.g., Sidman & Tailby, 1982; Stromer & Osborne, 1982).

Neutral stimuli that are made equivalent to stimuli that function in particular ways, for example, as conditioned reinforcers (Hayes et al., in press) or as ordering stimuli (Lazar & Kotlarchyk, 1986) acquire the function of the stimuli to which they become equivalent. We should expect, then, that neutral stimuli that are made equivalent to contextual stimuli should function as contextual stimuli in the absence of the original conditions which produced the contextual stimuli.

The first purpose of the present research was to extend the analysis of stimulus classes and class interactions by examining whether equivalence classes of contextual stimuli could be formed. The second purpose was to determine whether the derived contextual stimuli within the classes of equivalent contextual stimuli would function in the same way as the stimuli originally trained as contextual stimuli.

Specifically, subjects were trained to arrange six stimuli into groups of three based upon which of two contextual stimuli was present. When this task was mastered, novel stimuli were related to the two contextual stimuli to form two classes of three contextual stimuli. A test was then conducted to establish whether the derived contextual stimuli functioned as the original contextual stimuli.

METHOD

Subjects

Six undergraduate students (3 male, 3 female) enrolled in the introductory psychology course at Utah State University were recruited for the investigation over two academic quarters. Their ages ranged from 18 to 23 years. Subjects were given class points for participating in the research with bonus points given to those who completed the experiment.

Apparatus

Subjects were seated in a small room at a table with an Apple II® monitor and a joystick. An on-line Apple IIe® microcomputer, located behind a partition, arranged events and recorded data. Single Cyrillic letters were used for sample, comparison, and contextual stimuli (see Figure 1). When shown on the monitor, the letters projected as white on a black background and were 20 mm wide and 30 mm high.

Procedure

General procedure. Throughout this experiment, the subjects' task was a nominal matching-to-sample procedure in one of two formats. One was unconditional matching to sample with a sample stimulus centered 80 mm from the top of the screen and three comparison stimuli arrayed horizontally below it. Four-term contingencies were presented in the unconditional matching-to-sample format. The other was conditional matching to sample with a contextual stimulus centered 30 mm from the top of the screen, a sample stimulus below

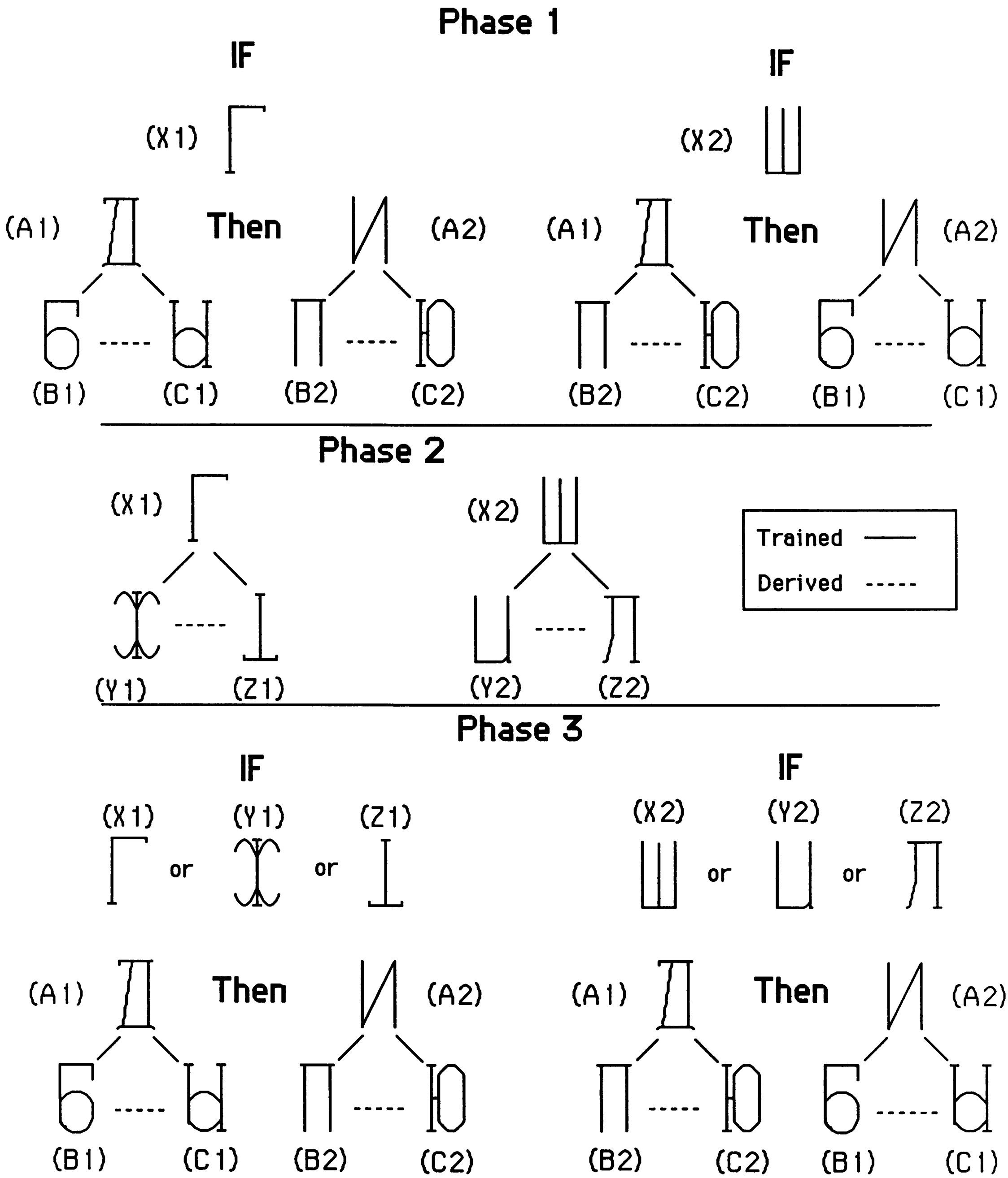

Fig. 1. Control of the organization of three-member classes by contextual stimuli. Solid lines represent trained relations and dashed lines represent potential transitive relations. Each panel represents the relations separately trained in that phase.

it, and three comparisons as before at the bottom of the screen (cf. Zimmerman & Baydan, 1963). Five-term contingencies were presented in the conditional matching-to-sample format. Both formats are portrayed schematically in Figure 2.

In the conditional matching-to-sample task, each trial began with the contextual stimulus

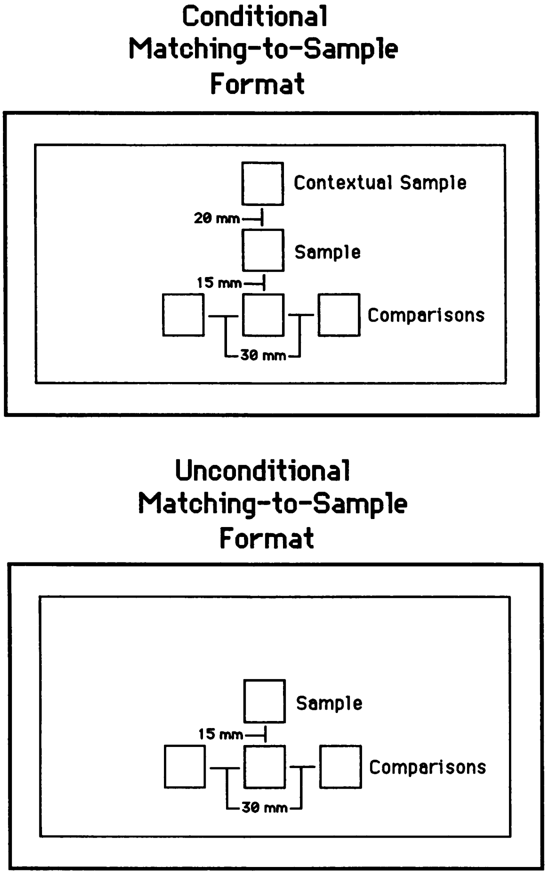

Fig. 2. On-screen formats for the matching-to-sample tasks of the study. Top panel contains the conditional matching to sample, that is, the presentation of five-term contingencies. Bottom panel contains the unconditional matching to sample, that is, the presentation of four-term contingencies.

presented at the top of the screen. When the button on the joystick was pressed, the sample stimulus was presented. When the button was again pressed, the three comparisons were presented. The subject could move the joystick left or right to place a cursor under a comparison stimulus. The subject pressed the joystick button to respond to a particular comparison. For the unconditional matching-to-sample task, the contextual stimulus was omitted. In each task, the position of the correct comparison and the two incorrect comparisons varied at random. The stimuli that appeared as incorrect comparisons were programmed to occur randomly.

At the beginning of training, each trial performed correctly on the first attempt resulted in the disappearance of the trial stimuli, presentation of the word "CORRECT" on the subject's monitor for 3 s and the increment of a points-counter that read "POINTS" followed by the amount of points accumulated. The next trial followed immediately. An incorrect response resulted in a 3-s blackout of the screen followed by the re-presentation of the same trial stimuli—a correction procedure—until the correct response was made. When a correct response was eventually made, the word "CORRECT" appeared on the screen for 3 s without the points-counter, and no points were given. After two sessions of scoring at least 75 correct responses in 80 trials (75/80), end-of-trial feedback was reduced from 100% of correct responses to approximately 35% of correct responses over two to four sessions. If the feedback reduction was to occur over more than 1 day, on the next day, feedback was increased to 90% of correct responses to ensure correct responding and was then reduced again.

Sessions comprised 80 trials, and two to six sessions for a total of 45 to 50 min occurred each day, 2 to 3 days a week.

Phase 1 training. Training began with the conditional matching-to-sample procedure. The subject was shown a contextual stimulus and a sample stimulus, and on the first trial of the experiment was instructed to select the comparison stimulus that went with the two stimuli above. (Verbatim instructions are presented in the Appendix.) In separate trial types, the subjects were trained to relate two stimuli to each sample stimulus. How the comparisons were to be matched to the sample depended upon which contextual stimulus was present. For example, when X1 was presented as the contextual cue, the subject earned points for responding in the presence of A1 to B1 or C1. However, if X2 was the contextual cue, the subject earned points for responses to B2 or C2 in the presence of A1. Which comparisons were to be related to A2 when it appeared as a sample were likewise controlled by the contextual stimuli. The potential stimulus relations established by such training are shown in Panel 1, Figure 1. The two incorrect comparisons for each trial were chosen randomly from the other three-member set of stimuli. For example, if X1 was the contextual stimulus and A1 the sample, then the incorrect comparisons could have been A2, B2, or C2.

Phase 1 testing. Test 1 evaluated symmetry.

Training trial types were randomly mixed approximately 50% with trial types in which sample and correct comparisons were interchanged (i.e., B1, B2, C1, or C2 were presented in the sample position, and a response to A1 or A2 was consistent with an inference of symmetry depending on the contextual stimulus). Test 2 evaluated the emergence of derived (transitive) relations under the control of the contextual stimulus for each of the four three-member classes. On the transitivity tests, training trial types were randomly mixed with 50% transitivity trial types (e.g., B1 was presented as the sample and a response to C1 was consistent with an inference of transitivity). At least four sessions were performed for each test. If the number of trials consistent with inferences of symmetry, transitivity, or contextual control per session was increasing, further test sessions were given until three to four sessions of performance of at least 75 consistent responses in 80 trials occurred. No feedback was presented on any trial types during test sessions.

Phase 2 training. This training incorporated the unconditional matching-to-sample procedure. In separate trial types the subjects were trained to relate two new stimuli to each of the contextual stimuli used in Phase 1 in order to potentially establish the relations illustrated in Panel 2 of Figure 1. The two incorrect comparisons for each trial were chosen at random from the other three-member class. For example, X1 was presented as the sample, Y1 was the correct comparison, and Y2 and Z2 were incorrect comparisons.

Phase 2 testing. Test 3 evaluated symmetry. The trial types used in Phase 2 training were mixed randomly with approximately 50% of trial types in which sample and correct comparisons were interchanged. That is, Y1, Y2, Z1, or Z2 were presented in the sample position, and the correct comparison was X1 or X2, depending on the contextual cue. Test 4 evaluated transitivity. Trial types employed in Phase 2 training were mixed randomly with 50% transitive trial types (e.g., Y1 was presented as the sample and Z1 was the correct comparison). Testing procedures followed those of Phase 1.

Phase 3 contextual class test. This phase tested whether the derived contextual class stimuli controlled the trained conditional relations of Phase 1. Testing took place with the training trial types of Phase 1 randomly mixed with approximately 50% of the new contextual class members in the fifth-term position (see Panel 3 of Figure 1). Testing occurred for a minimum of four sessions of performance at 75/80 consistent responses. The subjects were debriefed following this test.

Table 1

Number of sessions to complete each phase.

	Subjects					
	S1	S2	S3	S4[a]	S5	S6
Phase 1						
Training	7	9	18	16	11	6
Symmetry	7	4	7	4	4	4
Transitivity	8	4	5	4	4	4
Symmetry 2						1
Training 2						1
Symmetry 3						6
Transitivity 2						6
Training 3						1
Transitivity 3						4
Phase 2						
Training	5	4	6	15	4	5
Symmetry	4	4	4	3	4	4
Training 2				1		
Symmetry 2				5		
Transitivity	4	4	4	4	4	4
Phase 3						
Contextual generality test	4	4	5	5	4	6
Transitivity 2	1					
Test 2	6					
Total	48[b]	33	49	57	35	54[b]

[a] This subject performed in Phase 2 before completing Phase 1. Seven sessions of Phase 1 were conducted before the shift to Phase 2.

[b] Columns do not sum because data from two sessions for S1 and S6 were lost due to equipment failure.

RESULTS

Table 1 shows the number of sessions required to complete training and tests for each subject and the order of the conditions (with one exception). Figure 3 shows performance for each subject in each phase of the experiment. Shaded bars represent total responses per session that were consistent with original training and contextual control, symmetry, or transitivity (maximum = 80). Dots and squares represent percentages of each trial type within a session that were consistent with the above relations.

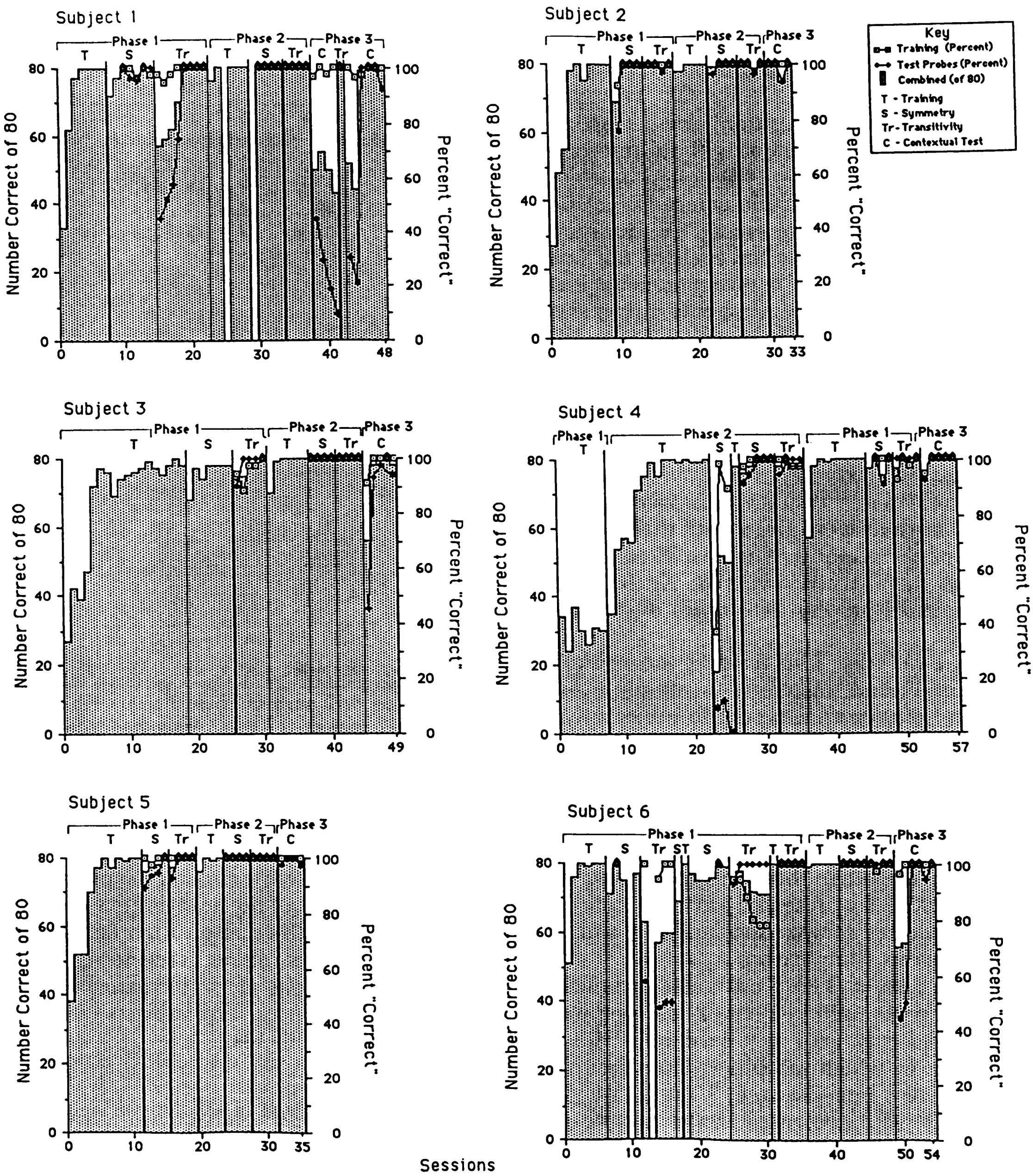

Fig. 3. Responses for each subject in each session and phase of the experiment. The shaded bars constitute the total responding in a session out of 80 trials. During training the bars depict the number of correct responses per session. During tests the bars depict the combination of the training and test trials. (Data are missing for S1 on Sessions 25 and 29 and for S6 on Sessions 10 and 13 due to computer malfunctions.) The point codes joined by lines constitute the percentage of "correct" (i.e., consistent) responding on the different trial types (i.e., training, symmetry, transitivity). No separate Phase 1 symmetry data are reported for S3 and only two points are reported for S6. Debriefing took place between Sessions 44 and 45 for S1 (see text).

Phase 1

Training. The conditional responses of all subjects came under the control of the contextual stimuli in Phase 1. The length of time needed to acquire the contextual discrimination varied across subjects from 6 to 18 sessions. S4 received seven sessions of training and did not exhibit any acquisition. This subject was then exposed to Phase 2 before continuing with Phase 1. However, the data in Table 1 for S4 are presented in the same order as for the other subjects in order to facilitate comparisons. Data in Figure 3 for Subject 4 are presented in the order in which the phases occurred.

Symmetry. Separate symmetry data were lost for S3 (the entire test), S6 (Sessions 7, 9, 10, and 11), S1 (Sessions 8 and 9), and S4 (Session 45). S1 was given two additional sessions because of the loss of these data. Four of the 6 subjects (S1, S2, S3, S5) showed perfect responding on symmetry test trial types within a few sessions. (This conclusion is by inference for S3 from the combined data on which, by the fourth symmetry test session, S3 responded consistently on all 80 trials). S6's combined data met criterion in five sessions, although responding was not perfect.

Transitivity. All subjects except S6 demonstrated transitivity within four to eight test sessions. Of these subjects, only S1 showed an acquisition-like function on the transitivity trial types. For the remaining subjects, responding on the transitivity trial types was at 100% by the first (S2, S4) or second (S3, S5) test session. (S4's data are read from Sessions 49 to 52).

S6's unchanging performance around 50% on the transitivity test trial types suggested the need to reexamine the symmetric relations. Recall that in the absence of separate symmetry data S6 met criterion in Phase 1 symmetry testing without being all the way to 100%. On a second symmetry test, combined data of 69 of 80 correct on Session 17 further suggested that the symmetry relations were weak. Accordingly, S6 was returned to training for one session (18), and six more sessions (19–24) of symmetry testing were necessary before symmetry performance reached criterion. Transitivity testing was reinstated at Session 25 and performance was near or above 75/80 combined, but performance on the trained trial types deteriorated. Because a week and a half had passed from the last training session, one session of training was administered at Session 31. The subject then exhibited four consecutive sessions of perfect responding to transitivity and training trial types.

Phase 2

Training. Most subjects learned the unconditional matching-to-sample task rapidly, requiring no more than four or five sessions (see Table 1). S4, who had never reached criterion on Phase 1 before being introduced to Phase 2, required 15 sessions.

Symmetry. All subjects but S4 demonstrated symmetrical relations on testing in Phase 2 (see Figure 3). S4's criterion performance on the training trial types was disrupted considerably by the introduction of symmetrical trial types in the symmetry test. The combined performance of S4 leveled off at 50/80 after three sessions. Responses to training trial types were much more accurate than those to symmetry test trial types. An additional training session was presented at Session 27 to get the training trial type baseline back near 100%. With a subsequent return to symmetry testing, S4's symmetry responses were at 100% of symmetry test trial types by the third session of this exposure to symmetry testing.

Transitivity. All subjects demonstrated transitive relations at criterion on testing.

Phase 3

On the contextual class test, Subjects 2 through 6 performed at criterion within four to six sessions. Both S3 and S6 exhibited acquisition-like functions on their responses to the derived contextual stimuli. When asked after the experiment to report verbally the conditional relations (as described in the Appendix), Subjects 2 through 6 were able to do so correctly for all the relations.

S1 scored below criterion on the contextual class test. The subject had no difficulty with the trained relations, scoring 97% to 100% correct. Test probe performance started at 46% and continuously fell, reaching 10% by the fourth session. A return to transitivity testing at Session 42 indicated that responses both to the training trial types and the transitive trial types were consistent, so two more sessions of the contextual test were presented. S1 continued to perform below criterion and requested to end the experiment. Again, trained relations were intact (97% to 100%) and test probe performance was poor (32% to 22%). During debriefing, S1 was able to report correctly each of the relations, except those of the contextual class test. She reported not knowing what to do when Y1, Y2, Z1, or Z2 were on the top of the screen (contextual class probes). She then asked whether the relation between those four stimuli and X1 and X2 was supposed to determine how to perform on the contextual class test. The experimenter responded by asking if she would like to try the test again. Four more sessions were performed, and S1 performed at criterion.

DISCUSSION

In the present study, each of the 6 subjects acquired four three-member classes of equivalent stimuli under the control of two contextual stimuli in a conditional matching-to-sample task. In a subsequent unconditional matching-to-sample task, it was then possible to relate two additional stimuli to each of the contextual stimuli, forming two additional three-member classes of contextual stimuli. Finally, it was shown that the equivalent stimuli in the contextual classes controlled performance of the conditional matching-to-sample task without having been trained directly in this function.

The research described here systematically replicates prior research on contextual control (e.g., Bush et al., 1989; Fucini, 1982; Lazar & Kotlarchyk, 1986) and extends the stimulus equivalence paradigm to the study of classes of contextual stimuli. Such an extension sets the stage for further analysis of fifth-term control (Sidman, 1986) and its usefulness in predicting and controlling development of complex stimulus classes such as those found in language.

The hierarchical nature of the five-term contingency allows conditional discriminations that occur in different contexts to be understood in each. For example, *mercury* is a member of a different class of equivalent stimuli when it is described in the context of metals than when it is described in the context of liquids (or Greek gods, floral delivery services, or automobiles).

Ordinarily, if two small classes such as *iron, mercury,* and *copper* (i.e., metals) and *water, milk,* and *mercury* (i.e., liquids) are linked by one member, one large class is formed (Fucini, 1982; Sidman, Kirk, & Willson-Morris, 1985). However, the classification of iron and mercury with water and milk is not behavior that is likely to be reinforced in a child's repertoire. Ideally, the child should be able to classify mercury as both a metal and a liquid without combining all elements of the metal and liquid classes together. Initial training with a contextual stimulus prevents the merging of the classes, whereas retraining with a contextual stimulus can divide a large class (Fucini, 1982). For example, the child can be taught to relate mercury to water and milk when the contextual stimulus *liquid* is present, and to relate mercury to iron and copper when the contextual stimulus *metal* is present. Or if water, milk, mercury, iron, and copper constitute one large class, the addition of the contextual stimuli can divide the class appropriately.

Classes of words used in natural settings are not usually simple, mutually exclusive groups of stimuli, but tend to overlap or intersect as in the metal/liquid example. Rarely are there single stimuli controlling natural language classes. For example, a child who has learned to differentiate between plants and animals may subsequently learn that the words *beast* and *creature* are synonymous with the word *animal.* Greater efficiency results if the new words also control the stimuli in the subordinate class in the same manner as does the word *animal.* That classes of contextual stimuli can be formed using stimulus equivalence procedures indicates the robustness of the procedures to describe the development of such complexities.

It should be noted that contextual control of transitive performance was not tested in Phase 1: B1 was always related to C1 and B2 to C2 independently of the contextual stimuli. Such a limitation does not compromise the results, because all the trained conditional relations were found to be dependent upon the contextual stimuli.

Some of the subjects had initial difficulty with the conditional matching-to-sample task. This showed up primarily in the number of sessions necessary for criterion attainment. For the most part, however, acquisition proceeded steadily for all subjects except S4. Because Subject 4 was able to perform the unconditional matching-to-sample task after experiencing much difficulty on the conditional matching-to-sample task, perhaps acquisition of the conditional matching-to-sample task would have been easier if the unconditional matching-to-sample task was taught first. Kennedy and Laitinen (1988) reported having great difficulty establishing contextual control when using a task in which the contextual stimulus was present from the beginning (analogous to the conditional matching-to-sample task in this experiment). In the present experiment, only Subject 4 demonstrated serious difficulty in learning the task. The most notable difference between the present procedures and those of Kennedy and Laitinen (1988) was that the present experiment employed three comparison stimuli per trial, whereas they used two comparisons (see also Bush et al., 1989). Serna (1987) and Sidman (1987) have suggested that using two comparisons may not work as well as using three or more.

We can say little about what produced the sudden change in S1's contextual classification performance, except to note that the change came during debriefing after she had verbally described all of the other relations in the task, except for those relations controlled by the potentially equivalent contextual stimuli. We would like to believe that this rehearsal may have contributed to the end result; however, it is distinctly possible that uncontrolled factors involved in the debriefing may have produced the same outcome.

Transfer of function across equivalent stimuli has been accomplished at least three times previously that we know of (i.e., Hayes et al., in press; Lazar & Kotlarchyk, 1986; Wulfert & Hayes, 1988) with different stimulus functions. In the Lazar and Kotlarchyk and Wulfert and Hayes studies, novel stimuli were made equivalent to a class of equivalent stimuli whose function was to determine the ordering of responses. The novel stimuli thereafter also controlled the ordering of responses. In the Hayes et al. study, novel stimuli were made equivalent to stimuli that functioned as conditioned reinforcers or as discriminative stimuli. Thereafter, the novel stimuli also functioned as conditioned reinforcers or as discriminative stimuli. In the present study, novel stimuli made equivalent to contextual stimuli thereafter controlled the conditional relations controlled by the contextual stimuli. In each of these procedures, stimuli that previously had no function were made functional via procedures that led to stimulus equivalence. Such transfers of function may provide a considerable explanatory tool for behavior analysis.

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APPENDIX

Instructions Given to Subjects

At the first session, subjects were seated in front of the computer monitor. The experimenter turned the monitor on, requested the subject to pick up the joystick, and said, "To begin the session, press the button on the joystick nearest the apple." When the first (contextual) stimulus appeared on the monitor, the subject was told, "To indicate that you've seen the stimulus, press the button." The sample then appeared, and the subject was told to press the button again. The comparisons then appeared. The subject was then told, "Choose the stimulus on the bottom that goes with the two stimuli above. Move the joystick left or right to position the cursor under the stimulus you think is correct. If you are correct, the computer will say 'Correct' and will give you a point. If you are not correct, the screen will go blank, and then it will show the same trial again. It will do this until you get the trial right. When you do, the computer will say 'Correct,' but you will not get a point. You must get it right the first time to get points. There are 80 trials each session." If the subject asked questions about how the stimuli went together, the experimenter replied to the effect that there was a consistent order, but that he or she must find out for him- or herself. The experimenter remained in the same room on the opposite side of a partition. Several subjects asked questions about the nature of the experiment and the relation between the stimuli during the course of the experiment. The experimenter responded that he could not discuss the questions at that time, because that might spoil the experiment but would explain everything when the experiment was completed.

When end-of-trial feedback was reduced, the subjects were told before they began, "I'm going to make things a little harder. I'm not going to give you feedback on whether you were correct on every trial, OK?"

When testing began, the subjects were told, "Today I'm going to test you to see what you've learned. I'm going to show you some new things, and because it's a test, I can't give you any feedback."

At the start of Phase 2, the subjects were told that they were going to start something new. If the subjects asked whether they were supposed to press the button as before, the experimenter responded, "Yes." No other instructions were given. During end-of-trial feedback reduction and symmetry and transitivity testing, the same instructions as used for Phase 1 were given.

When the subjects were ready for the contextual class test, they were told, "OK, we're going to do something new now. There will be three levels on the screen again." No other instructions were given.

When the subjects completed the experiment, they were shown line drawings of the stimuli arranged randomly in a single column and asked how they went together. If the subjects did not volunteer names for the stimuli, they were asked if they had their own names for the stimuli.