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An Extension to the AVC Discrimination Test by the Addition of One Level Above AVC Level VI

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AN EXTENSION TO THE AVC DISCRIMINATION TEST BY THE ADDITION OF ONE LEVEL ABOVE AVC LEVEL VI

by

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Kerr, Meyerson and Flora (1977) devised a series of six small learning tasks that could be used to assess developmentally disabled individuals on the typical tasks to be performed in a school setting or sheltered workshop and required very simple equipment. The tasks were imitation, position discrimination, visual discrimination, match-to-sample, auditory discrimination and combined auditory visual discrimination. Davine (1990) suggested that there may be transitional skills between AVC levels IV and V not found by Kerr et al. Davine (1990), Wilson (1991) and Butler (1992) devised a series of experimental tasks designed to test this notion. All used nonidentity matching tasks with the result that none of these tasks were clearly intermediate to AVC levels IV and V and were often more difficult than AVC level VI.

In the present experiment, a new experimental step was designed to extend the AVC test to higher functioning individuals with a level above the highest existing level, VI. Four containers were used with correct selection of the container requiring simultaneously attending to two stimulus dimensions, container type and color, with two categories within each dimension for a total of four variables, red, yellow, box and can. The new step was significantly more difficult than AVC level VI and exhibited most of the characteristics of the previous AVC levels.

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Charles P. Butler

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Discrimination Skills and Developmentally Disabled Individuals

The assessment of repertoires in developmentally disabled individuals for the prediction of their success or failure on the typical tasks to be performed in a school setting or sheltered workshop has been historically poor. Intelligence testing is not a good predictor because it does not test the specific skills that are required for the low level tasks developmentally disabled individuals typically perform. Intelligence tests were specifically designed to assess the capabilities of normal individuals and more specifically for predicting their academic performance in regular classes. It is primarily the vocal and instruction following (language) behavior of normal individuals that is manipulated in the academic environment while developmentally disabled individuals are typically taught non-language skills in their school or workshop settings. In particular, good performance on intelligence tests is highly correlated with well developed language skills, an area that is frequently lacking in developmentally disabled individuals. In some cases, language skills in developmentally disabled individuals may be so poor that they may not even be able to follow the instructions required to perform the intelligence test properly. However, even with such poor language skills, these developmentally disabled individuals can frequently be taught a variety of low-level non-language tasks.

Most baseline measures specifically designed to assess repertoires in developmentally disabled individuals are checklists of relatively global, learned behaviors related to eating, dressing competence, personal hygiene, toileting independence, knowledge of

current events, or identification of numbers or colors. These assessments do not identify specific component behaviors or specific forms of stimulus control that are required for successful performance of the global behaviors being assessed. In other words, these measures have limited utility both in specifying the component behavior and/or forms of stimulus control that a person has in his/her repertoire, and in identifying what behaviors and/or forms of stimulus control are needed for further learning to occur.

Kerr, Meyerson and Flora (1977) were puzzled by the inexplicable failure of some children to learn some forms of stimulus control under the same system of reinforcement of successive approximations, and with the same teacher, that previously had resulted in rapid learning of other forms of stimulus control. Subsequently, they examined the curricula of developmentally disabled individuals in many programmed and traditional training settings. Regardless of the specific tasks that were taught in different settings and age groups, the following specific behaviors and/or forms of stimulus control were frequently required: imitation, position discrimination, visual discrimination, match-to-sample, auditory discrimination, and auditory–visual combined discrimination.

Kerr et al. (1977) investigated the rapidity with which the above listed tasks could be learned in developmentally disabled individuals, regardless of age. They devised a series of small learning tasks that would require only very simple equipment and that could be easily carried out in a simple testing situation. The materials used included a plain yellow can, a plain red and white striped box, a small irregularly shaped piece of white foam rubber, a small yellow wooden cylinder, and a small red cube. Subjects were required only to put one of the three objects into one of the two containers. The behavior being tested was not the ability to put objects in containers but the ability to make responses under the control of specific stimuli based on the above listed tasks (imitation,

position discrimination, etc.). The criterion for mastery was eight consecutive correct responses before eight cumulative errors were made. Specifically, the following questions were explored:

1. Do students show quick mastery of some tasks but not others. That is, are some tasks more difficult than others?

2. Does the same order of difficulty for the tasks exist for most subjects, or are patterns of success and failure idiosyncratic?

The goal was not just to test for the existence of the repertoire but to teach the correct responses for each task within a reasonable number of trials. Social approval followed each correct response. Tangible reinforcers such as M & M's, pretzels, fruit juice, or water served as back-up reinforcers on a variable ratio (VR) schedule (VR2–VR8 for different subjects).

In the Kerr et al. study, 117 mentally retarded children and adults were examined. Some were institutionalized and some attended day schools. The severity of impairment ranged from mild to profound retardation and the subjects ranged in age from 3 to 36 years. Those who had physical handicaps that might impair their ability to perform the simple tasks involved were excluded from the group. Those with severely impaired vision or hearing were also excluded from the group. Except for those exclusions, an effort was made to include every developmentally disabled individual attending the several schools and institutions in the area.

The AVC Test

Kerr et al. refer to specific forms of stimulus control as discriminations, a term which will be used at times to maintain continuity with previous work. The Combined

Auditory and Visual discrimination (AVC) test divides the discriminations into six distinct categories. These categories were arranged such that they would attempt to test the simplest skill first, then the more difficult tasks in order of difficulty, and finally the most difficult task last. The six categories are described below:

Level 1: Imitation

The subject is taught to put the object in a container. *One of two available containers is placed on the table at a time.* The experimenter first demonstrates the behavior, physically guides the subject through the correct behavior, then asks the subject to do it. More specifically, the experimenter models placing the red cube in the red and white striped box (the red box, as it will be referred to subsequently, is the only container available) and then says to the subject "Put it in." In the next step, the experimenter models placing the foam in the yellow can (in this step, the yellow can is the only container available) and then says to the subject "Put it in."

Level 2: Position Discrimination

The subject is taught to put the object in the same container that the experimenter puts it in. *Two containers are placed in front of the subject and remain in the same position throughout testing but the object is always placed in the yellow can.* First, the tester demonstrates the correct response while describing what is being done (e.g., "I am placing the foam in the yellow can"), physically guides the subject through the correct response, then asks the subject to do it by saying "Where does it go?" Both containers are available to the subject.

The subject may be taught one or both of two discriminations in this task: a) to

put the object in a container in a particular position, b) to put the object in a container with specific visual characteristics. However, the experimental results suggest that the former task is substantially easier than the latter.

Level 3: Visual Discrimination

The subject is taught to select the correct container on the basis of visual stimuli. Both containers are placed in front of the subject. *The containers are removed after each trial and replaced in the same or a different order, according to a predetermined pattern.* The object is always placed in the yellow can. In the first step, the tester demonstrates the correct response while describing what is being done (e.g., "I am placing the foam in the yellow can"), physically guides the subject through the correct response, then asks the subject to do it by saying "Where does it go?"

Level 4: Match-to-Sample

The subject is taught to put the object in the container with the color and shape which is similar to the object. In the first step, both containers are placed in front of the subject. The containers are removed after each trial and replaced in the same or a different order, according to a predetermined pattern. The tester demonstrates the correct response while describing what is being done (e.g., "I am placing the yellow cylinder in the yellow can"), physically guides the subject through the correct response, then may ask the subject to do it. During this pre-testing phase, the experimenter must put the yellow cylinder only in the yellow can and the red cube only in the red box. In the next step, the experimenter asks the subject to do it by saying "Where does it go?" The subject is taught to match-to-sample.

Level 5: Auditory Discrimination

The subject is taught to put the object in a container with specific visual characteristics on the basis of auditory stimuli. Two auditory stimuli are used that are also vocal stimuli. Both containers are placed in front of the subject and *remain in the same position* throughout testing. The tester demonstrates the correct response while describing what is being done (e.g., "I am placing the foam in the yellow can"), physically guides the subject through the correct response, then may ask the subject to do it.

Vocal instructions are provided which may instruct the subject as to the correct placement of the object. The quality of the experimenter's voice is varied with each instruction (e.g., monotone and slow for the red box, and quicker and with a rising pitch for the yellow can) so as to make the voice sound as different as possible for each instruction. Though not stated by the authors, the difference in pitch and rate between the spoken instructions was apparently to ensure that they were sufficiently different so that a discrimination could be made even if the instructions themselves could not be discriminated—that is, the subject did not have adequate receptive language to make a discrimination.

The subject is taught to put the object in the correct container according to the auditory (vocal) stimulus provided by the experimenter and the specific visual characteristics or location of the container. In other words, there are two stimuli that control the response in this step, auditory and visual, while there was only one stimulus, visual, controlling the response in previous steps.

At this level, the degree of receptive language present in each subject may determine whether this is a test of receptive language (i.e., there is a relevant conditioning

history with respect to the stimuli used) or is testing a novel auditory discrimination. For subjects with good receptive language, the task should be easier than if receptive language was absent.

Level 6: Auditory and Visual Combined

This level attempts to combine levels 3 (Visual Discrimination) and 5 (Auditory Discrimination). The subject is taught to put the object in a container with specific visual characteristics on the basis of auditory (vocal) stimuli. Both containers are placed in front of the subject. *The containers are removed after each trial and replaced in the same or a different order, according to a predetermined pattern.* The tester demonstrates the correct response while describing what is being done, physically guides the subject through the correct response, then asks the subject to do it.

Instructions are provided as to the correct placement of the object. As in the previous step, the quality of the experimenter's voice is varied with each instruction (e.g., monotone and slow for the red box, and quicker and with a rising pitch for the yellow can) so as to make the voice sound as different as possible for each instruction. The subject is told to put the foam in either the red box or the yellow can according to a predetermined pattern.

The subject is taught to put the object in the correct container according to the auditory (vocal) stimulus provided by the experimenter and the specific visual characteristics of the container. The chance that the subject could learn to put the object in a container in a specific location, as in the previous level, has been eliminated since the location of the container changes with each trial. The comments regarding the novelty of the controlling stimuli and the difficulty of the task in level V also apply to this level.

Pass/Fail Criterion

The subject passes any particular level after eight consecutive correct trials and fails after 8 cumulative incorrect trials. In other words, after the subject makes a single error, s/he must then begin a new series of correct trials, scoring eight consecutive correct trials. When the subject makes an error, the experimenter will say to the subject "No, that's not the ______. This is the ______." The subject is physically guided in making a correct response if needed. Next, the experimenter says "Now do it all by yourself. Put it in the ______." A successful correction trial is not counted as a correct trial but an error on a correction trial is counted as an error.

Major Findings

The order of difficulty of learning for the six tasks from easiest to most difficult was: imitation, position discrimination, visual discrimination, match-to-sample, auditory discrimination, and auditory–visual combined (AVC) discrimination. These tasks were assigned levels ranging from level I for imitation, the least difficult, to level VI for the AVC task, the most difficult. This order of difficulty was the same for most of the students tested by these authors. These findings held for a heterogeneous sample of individuals who varied with respect to gender, level of retardation, and age.

Another result of this study was that older children tended to pass higher level AVC discriminations than younger children. The authors stipulate that while the subjects in their study were not representative of all developmentally disabled individuals in the population, their data suggest that as age increases, so does auditory–visual discrimination skill, even among moderately and severely retarded adults. However, the

authors suggest that there is no reason to ascribe the tendency of older children to pass higher level AVC discriminations solely to maturation. Data from Meyerson (1977) suggested that it was difficult to teach discriminations that subjects failed on the AVC test. Subjects who made eight cumulative errors on a particular level of the AVC test required up 900 trials with an informal procedure before they were able to subsequently pass that level on the AVC test. This suggested that those who passed a particular AVC level were already able to make the discrimination being tested at that level and were being taught a simple task in the process of passing that level. Subjects who failed a particular AVC level were unable to make the discrimination being tested and were requiring a large number of trials to learn the discrimination.

Confirmation and Extension of AVC

Several studies have been performed to both verify and extend the results of Kerr et al. (1977). Several researchers have demonstrated that the discriminations which are tested in the six levels of the AVC test are acquired hierarchically (Martin, Yu, Quinn, & Patterson, 1983; Tharinger, Schallert, & Kerr, 1977; Wacker, 1981; Wacker, Kerr, & Carroll, 1983; Wacker, Steil, & Greenbaum, 1983; Yu & Martin, 1980; Yu, Martin, & Williams, 1989). In other words, the highest discrimination level passed by a subject usually includes passage of all lower levels as well. For example, when a subject's highest passed level is level IV, levels I through III have usually been passed as well.

The AVC test can be used to assess the performance of the developmentally disabled for placement into training groups (Wacker, Kerr & Carroll, 1983; Wacker, Steil & Greenbaum, 1983; Yu, Martin & Williams, 1989). Further, the results of the AVC test can be used to determine which training method might be most productive in

teaching a failed level. It has been very difficult to teach failed discriminations (Witt & Wacker, 1981; Yu & Martin, 1980) but the results of the AVC test make placement into vocational and learning groups more accurate. The result has been better success in those training groups because subjects can make the discriminations required for the training (Martin, Yu, Quinn & Patterson, 1983; Tharinger, Schallert & Kerr, 1977; Wacker, Kerr & Carroll, 1983; Wacker, Steil & Greenbaum, 1983). Training for higher failed levels can be carried out with other more specialized procedures.

The AVC test has been used with hearing impaired clients where manual signs were used at levels V and VI instead of auditory stimuli (Kerr & Meyerson, 1977; Wacker, 1981). Wacker discussed the prior signing experience of his subjects who were considered candidates for ongoing sign language programming. In both studies, the same hierarchy which emerged with the normal hearing subjects also emerged in the hearing impaired when manual signs were substituted for auditory stimuli. In these investigations, the modality of the controlling stimulus (discriminative stimulus— S^D) in levels V and VI was visual rather than auditory.

Kerr and Meyerson (1977) observed that the similar results could be due to the possibility that both the auditory S^Ds and the manual sign S^Ds represent a higher level of symbolism than matching like objects. In AVC level IV, the stimulus that evokes the behavior of placing the object is physically similar to the object itself—this is an instance of identity matching. In AVC levels V and VI, there is no physical similarity between the stimulus that evokes the behavior of placing the object and the object itself—it is an arbitrary stimulus. This is true regardless of whether the stimulus is auditory or a visual sign—these are instances of nonidentity matching. Kerr and Meyerson (1977) have suggested that what is occurring in levels V and VI is symbolic matching.

The suggestion that both the auditory S^Ds and the manual sign S^Ds represent a higher level of symbolism than matching like objects should not necessarily imply that the task would be more difficult. Pigeons can easily learn symbolic match-to-sample. Carter and Eckerman (1975) found that identity between a sample and one of the comparison stimuli appeared to play no role for pigeons that were being taught conditional discriminations. In other words, pigeons did not require more trials to learn symbolic matching than to learn match-to-sample. It was hypothesized that with those subjects, all matching problems whether symbolic or match-to-sample, involved the learning of "if...then" rules.

The difficulty of AVC levels V and VI, whether the stimuli are auditory or manual signs, may be due to the complexity of the stimuli rather than whether they are symbolic. In both cases, the stimulus lasts for several seconds during which time there may be tremendous variability in the stimulus. In the case of the auditory stimulus, there is variability in pitch and intensity that changes in intervals measured in milliseconds. In the case of manual signs, there is variability in the position of the fingers and shape of the hands that changes in intervals measured in tenths or hundredths of seconds. While there may be fewer changes over the same time interval with manual signs, this is a different sense modality which may be less well adapted to discriminating changes over very short time intervals. It may be that each may be an equally complex stimulus to the subject and far more complex than the stimuli used in AVC level IV, match-to-sample.

Extending the AVC Test

The studies mentioned above suggest that the variable or variables being tested in AVC levels V and VI are not as simple as had previously been thought. In order to

extend the AVC test beyond AVC level VI, there must be some suggestion of what is being tested at that level. The following discussion will cover topics that seem relevant to the discriminations that must be made in order to pass AVC level VI in the hope that a level VII can be hypothesized and subsequently demonstrated to be a viable AVC level.

Arbitrariness of the Auditory Stimulus

Kerr and Meyerson (1977) had previously suggested that the symbolic matching in AVC levels V and VI was more difficult than the match-to-sample of AVC level IV and that this was the basis for the increased difficulty of these AVC levels. Davine (1990) hypothesized that a non-vocal arbitrary stimulus could be used as the basis for an AVC level that would fall between levels IV and V in difficulty. Davine (1990), Wilson (1991), and Butler (1992) investigated this possibility using diverse procedures and stimuli yet obtained similar results in that none of the experimental steps they devised, using non-vocal arbitrary stimuli, clearly fell between AVC steps IV or V. In most cases, their experimental steps seemed as difficult as AVC level V or VI. Butler devised one experimental step (9x) using a novel vocal stimulus which was the most difficult of all his experimental steps, and was more difficult than AVC level VI. The explanation for this level of difficulty may be the complexity of the stimuli and/or the behavior that is required rather than the arbitrariness or symbolic quality of the stimuli. The auditory stimuli used in AVC levels V and VI are quite complex, and equal in complexity to the stimuli used by Butler (1992) in his step 9x. Butler found that his step 9x, which used novel vocal stimuli, was much more difficult than AVC level VI. All of his subjects passed AVC level VI but only one in 12 passed his step 9x. The difference between the stimuli used by Butler in his study and the stimuli used in AVC levels V and VI is not in

the complexity of the stimuli themselves (they were vocal stimuli similar in length both in time duration and number of words to those used in AVC levels V and VI) but in the conditioning history of the subjects with respect to the stimuli. The stimuli used by Butler were intended to be novel stimuli (they included technical terms used in the field of audio engineering) while the stimuli used in AVC levels V and VI are in common use in day-to-day activities and may not be novel.

Subjects who pass levels V and VI on the AVC test may have a significant conditioning history with respect to the specific auditory stimuli used. These stimuli are extremely complex in terms of the number of variations in pitch and intensity even for a brief stimulus of a few seconds, but a significant conditioning history combined with a biological propensity to learn language more quickly than would be expected through contingency shaping alone during childhood (Lenneberg, 1969) could result in the well developed repertoire we call receptive language. The balance between the complexity of an auditory stimulus, the conditioning history of the subject, the biological propensity to learn language rapidly during childhood, developmental delays and/or disabilities, and possibly the complexity of the behavior which is evoked by the stimulus, all these factors might determine the difficulty of a "receptive language discrimination."

The suggestion is that what is being tested in AVC levels V and VI is receptive language discrimination rather than a simple auditory discrimination. In other words, the subject is likely to behave in the same way that most others who have a similar conditioning history (have grown up in the same culture and learned the same language) would behave, given the same auditory/vocal stimulus.

Auditory Discrimination in AVC Levels V and VI

In later work by Kerr, Meyerson and Flora (1977), the vocal stimulus for levels II through IV was changed from "Put it in the red box/yellow can" to "Where does it go?" This was done to ensure that the auditory/vocal stimulus was not functioning as a significant stimulus for the correct response. The auditory stimulus for levels V and VI was not changed. This created a condition in which the auditory stimulus was different for levels II through IV than for levels V and VI. That is, in levels II through IV, the auditory stimulus was identical for each trial while in levels V and VI, the auditory stimulus varied from trial to trial and was a variable in determining the correct response. A discrimination could have been based on the differences in pitch and/or intensity in the stimuli and any conditioning history with respect to those stimuli.

Possible Functions of Auditory Stimuli in the AVC Test

If the auditory stimulus was not significant in terms of the conditioning history of the subjects, it would not matter whether it was "Put it in the red box" or "In the following trackability tests" (one of the stimuli used by Butler in his step 9x). However, in the case of the stimulus used in AVC levels II through IV, "Where does it go?" the stimulus is the same for both conditions, yellow can or red box. With the stimuli used in levels V and VI, the stimulus is "Put it in the red box" for one condition and "Put it in the yellow can" for the other. If in fact, these stimuli were novel, any two auditory stimuli would suffice. Butler (1992) tested this notion with his experimental step 9x which utilized novel auditory/vocal stimuli. In one condition, the stimulus was "In the following trackability tests" and in the other condition the stimulus was "Skating

compensation." These stimuli were chosen specifically because it was believed that they would be novel for most if not all subjects. The result was that only one of the subjects in 12 was able to pass step 9x. Yet, it could be argued that the stimuli used by Butler were more different from each other than the stimuli used in AVC levels V and VI, making a discrimination potentially easier than with AVC levels V and VI. Yet the result was just the opposite: it was more difficult to choose the correct container using Butler's stimuli than the stimuli used in AVC levels V and VI. One way to account for this anomaly is to suggest that the novelty of the stimuli used in AVC levels V and VI is a significant variable in the case of making a discrimination in those levels, and therefore that receptive language may be a significant variable.

Auditory Discrimination and Language

A distinction between novel auditory discrimination and receptive language would be determined by a history of reinforcement for behaving in specific ways that were similar to others in that culture with respect to specific, usually auditory stimuli. In other words, receptive language necessarily involves a significant history of reinforcement for behaving in certain specific and standard ways under the control of certain specific vocal stimuli, while non-language discrimination involves behaving in specific but not necessarily standard ways under the control of any two different auditory but not necessarily vocal stimuli. In the case of receptive language, all those in the same culture would behave in the same way under the control of the same stimuli while with a simple, novel auditory discrimination, the behavior evoked by the stimuli is arbitrarily chosen by those who contrived the contingency and may not be the same as in another member of the culture. If the subject can discriminate the pitch and intensity of an auditory stimu-

lus, s/he should be able to discriminate one auditory stimulus that significantly differs on those parameters from another. A very different reinforcement history is necessary to be able to make a novel auditory discrimination than to be able to effectively engage in receptive language behavior since receptive language behavior must be similar to the behavior of others in the same culture while any number of responses may be acceptable under the control of a novel stimulus.

It is important to further clarify the behaviors of receptive language for a better understanding of the role that language discrimination could play in the AVC test. Language can be broken down into two major categories: expressive language which is behavior emitted by a speaker, and receptive language which is behavior emitted by a listener under the control of stimuli emitted by a speaker. It is important to note that a single individual can be both a speaker and listener at the same time. Skinner (1957) has provided a detailed analysis of the behavior of a speaker and its controlling variables. Skinner (1957) has also suggested that the behavior of a listener is not unique and as such, does not deserve any special consideration. It is true that the behavior of a listener is not topographically unique and cannot be generally distinguished from any other behavior in that regard. However, it could be argued that behavior which is controlled by a vocal stimulus is a unique functional class of behavior, unique by virtue of the form of control.

In regard to the AVC test, the main concern is with how one behaves with respect to auditory/vocal stimuli as a result of a reinforcement history with respect to those stimuli. For instance, when the subject hears "Put it in the red box," does s/he engage in behavior similar to others in the same culture, no behavior at all, or behavior very different from others in the culture. The discrimination being tested in AVC levels

V and VI may be a combination of responding differentially to pitch and/or intensity, and responding in the same way as others who have a similar reinforcement history with respect to those stimuli. Subjects must be able to distinguish those unique stimuli from the thousands of possible combinations of pitch and intensity we call vocabulary, without having any direct comparison to any other stimuli, and behave in the same way as others in the culture who would hear the same stimuli. In other words, the culturally generated repertoire must be longer lasting to be effective. In a non-language discrimination, such as a simple arbitrary discrimination, subjects must only distinguish two stimuli from each other, both of which are currently available. This implies that a receptive language discrimination is significantly more difficult than a simple auditory discrimination because a stronger response, i.e., more resistant to extinction (Skinner, 1957, pp. 206–209), must be present. If (a) the subject has learned to make receptive language discriminations and (b) has a history of reinforcement for making such discriminations similar to others in the culture with the relevant stimuli, they should score well on AVC levels V and VI. This increase in the complexity of the discriminations at AVC level V and above may be responsible for the difficulties in determining (a) whether a level between levels IV and V was possible, and (b) what kinds of discriminations might be relevant for new levels above level VI.

Developmental Variables in Language Acquisition

Several lines of research have suggested that receptive language and instructional control develop in children at about the time that they begin to pass levels V and VI. Kerr and Meyerson (1977) have hypothesized that each of the AVC levels is in some way analogous to Piaget's Stages of Sensory Motor Development. In this regard, as the levels

in the AVC test increase, each of the discriminations in the AVC test corresponds to similarly increasing levels of Sensory Motor Development. AVC levels V and VI correspond to Piaget's Preoperational Sub-period, which normally occurs at the ages of 2–6 years. According to Piaget, this is a period of rapid development of symbolic thought and verbal behavior (Heatherington & Parke, 1975). Kerr and Meyerson's data show that it is during this period that normal children begin to pass AVC levels V and VI. Kerr and Meyerson suggest that "Speech S^Ds now serve as effective signals that quickly come to guide differential responding in a learning situation. Exactly how these three sets of variables—symbolic capacity, auditory skills, and verbal skills—are related remains a fertile field for investigation" (p. 175, 1977).

According to Lenneberg (1969), language development occurs mostly within the same age range as Piaget's Preoperational Sub-Period. He delineates approximately age two years as the age where vocabulary exceeds 50 words and age four and one half years as the age where language is well established. According to both Piaget and Lenneberg, language seems to be the most important skill that is learned after match-to-sample. These observations suggest that what is being tested in AVC levels V and VI is some degree of mastery of (receptive) language rather than simple auditory discrimination.

Bentall and Lowe (1987) demonstrated instructional control in children between the ages of 22 months and 5 years. Subjects given high-rate instructions (i.e., instructions which evoked high-rate behaviors) exhibited behavior which is not normally seen in that age group but was in accordance with the instructions provided. Several studies (Bentall & Lowe, 1987; Bentall, Lowe, & Beasty, 1985; Boren and Devine, 1968; Danforth, 1983; Parsons & Ferraro, 1977; Parsons, Taylor, & Joyce, 1981; Ozuzu, 1982; and Vaughan, 1985) conducted with children indicate that the ability to follow and formu-

late rules occurs early in childhood and coincides with the development of a speaker's repertoire. During the period between age two and five, the development of a rule following repertoire is apparent. Children in this age group can follow instructions to produce behavior not typically found in this group, although their abilities to follow instructions are more limited than those of older children (Bentall & Lowe, 1987). Children in this age group can also formulate and use self-generated rules but this skill does not fully develop until age five and later (Bentall & Lowe, 1987). The transitional period which occurs from age 22 months to 5 years includes the development of abilities which permit the child to react effectively to the verbal behavior of others, as well as to his own verbal behavior.

These studies suggest that advanced language skills and rule following are the most salient skills to develop after the simpler skills like match-to-sample. This seems to be in accord with the existing hierarchy of the AVC test. However, it suggests that AVC levels V and VI may be testing more than simple auditory discrimination — they may also be testing language skills and rule following.

Rule-Governed Behavior

In attempting to explain problem solving, Skinner (1969) described a phenomenon he called rule following or rule-governed behavior (p. 146). Rule-governed behavior (RGB) is behavior which occurs not primarily through direct strengthening by reinforcement (contingency shaping) which is often a slow process, but is evoked by contingency-related stimuli constructed either by the problem solver himself or by others. These stimuli are usually constructed in verbal form and often express relations between stimuli and the reinforcing consequences of responses made to them. Skinner describes the

nature of rule-governed behavior in the following way:

> As a culture produces maxims, laws, grammar, and science, its members find it easier to behave effectively without direct or prolonged contact with the contingencies of reinforcement thus formulated. The culture solves problems for its members, and it does so by transmitting discriminative stimuli already constructed to evoke solutions (1969, p. 141).

Rules control the topography of behavior but do not control the probability of its occurrence in the same way that reinforcement does (i.e., rules do not systematically strengthen that general class of response). Rules often facilitate the acquisition of complex behavior. In the context of the AVC test, the stimuli used in levels V and VI may be rules that could facilitate the acquisition of the correct response. The advantage of rule-governed behavior as an aid in acquiring complex behavior is especially evident when one considers these features of rules: (a) "Rules can usually be learned more quickly than the behavior shaped by the contingencies they describe," (b) "Rules make it easier to profit from similarities between contingencies...", and (c) "Rules are particularly valuable when contingencies are complex or unclear or for any reason not very effective" (Skinner, 1974, p. 138).

Skinner reserves the term "rule-governed" only for those instances in which a description of contingencies has been verbally stated, either by a separate rule–giver or by the listener himself. However, the rule does not need to specify the complete contingency. The behavior must be specified but the consequence may be implied as in a fragmentary rule. In following such rules, an individual emits a novel behavior in much less time than would be possible if that behavior were contingency-shaped alone. Given an effective history with rules, the rule–follower need never experience the contingencies stated in the rule in order to follow the rule effectively. However, when a behavior has

been emitted solely under rule control, contingencies begin to affect the behavior from that point on. In fact, "The difference between rule–following and contingency–shaped behavior may be observed as one passes from one to the other in 'discovering the truth' of a rule" (1969, p. 151).

Several studies (Baron, Kaufman, & Stauber, 1969; Galizio, 1979; Kaufman, Baron and Kopp, 1966; Lippman & Meyer, 1967; Matthews, Shimoff, Catania, & Sagvolden, 1977; Shimoff, Catania, & Matthews, 1981, Shimoff, Matthews, & Catania, 1986) have demonstrated that instructions have a powerful effect on behavior. The effect was similarly powerful whether the instructions were accurate or inaccurate. In these studies, subjects' behavior was often more controlled by rules than by contingencies. Even inaccurate instructions of any nature were able to override control by scheduled contingencies.

Effects of Accurate Instructions

Several investigators have demonstrated that accurate instructions about scheduled contingencies resulted in rapid acquisition of behavior which is characteristic of those contingencies. Kaufman, Baron and Kopp (1966), using a variable interval (VI) 1-min schedule, found that subjects who were given detailed instructions about how VI reinforcement was scheduled rapidly acquired the characteristic nonhuman variable interval pattern of responding. Instructions which simply told subjects to make the point-counter advance did not result in characteristic variable interval performance, indicating that the more detailed the instructions, the more the resulting performance will correspond to scheduled contingencies.

Effects of Inaccurate Instructions

In several studies, subjects have followed inaccurate instructions even though the resulting behavior was quite discrepant from that normally associated with that schedule. In Kaufman et al. (1966), scheduled contingencies were VI 1-min and subjects were given instructions that described the schedule as fixed interval (FI) 1-min or variable ratio (VR) 150. In both cases, subjects exhibited response patterns typical of the instructed schedule rather than the actual schedule. In a subsequent experiment, Kaufman et al. presented inaccurate instructions during a three hour period in which extinction was scheduled. Responding in the extinction component was weakened, but persisted during the three hour session. Lippman and Meyer (1967) obtained similar results when an FI 20 schedule was programmed and subjects were given instructions appropriate to a ratio schedule. Subjects responded at the higher rates that would be appropriate to a ratio schedule, rather than the slower rates that would be expected under an FI schedule. Galizio (1979), using a multiple avoidance schedule, demonstrated that subjects will follow inaccurate instructions only when doing so does not lead to an obvious aversive consequence, which was loss of reinforcement in this experiment. He compared the effects of inaccurate instructions under two conditions: (a) following the inaccurate instructions led to point loss and onset of a loss light and tone, and (b) following the inaccurate instructions did not lead to onset of the light and tone. Both groups of subjects initially followed the inaccurate instructions. Subjects whose behavior was followed by the stimuli associated with loss eventually ceased to follow the instructions. Subjects whose behavior was not followed by the light and tone continued to follow the inaccurate instructions.

These studies illustrate some of the characteristics of instructional control. Since it is not clear whether instructional control is a real variable in the AVC test, an understanding of the phenomenon will help to put it into perspective.

The Pervasiveness of Instructional Control

The studies reviewed above clearly indicated that presentation of instructions to human subjects, whether accurate or inaccurate, resulted in persistent patterns of performance which corresponded to the instructions provided. In light of these findings, researchers became interested in discovering conditions in which human subjects would come under control of scheduled contingencies if instructions were minimized. Investigators found that under conditions in which instructions were minimized, behavior was established which initially appeared to conform to scheduled contingencies, but did not change along with further changes in the contingencies (Matthews et al., 1977; Shimoff, Catania, & Matthews, 1981, Shimoff, Matthews, & Catania, 1986). These results indicate that instructions, however minimal, exert strong influence on behavior.

Shimoff et al. (1986) demonstrated that even when behavior appears to be under the control of contingencies and changes according to changes in the contingencies, further manipulations can reveal the instructional nature of that control. Subjects received pre-session training about schedules which required them to correctly describe ratio and interval contingencies and specify rates of responding that are appropriate for each schedule, and instructions about how the experimental apparatus operated. Subjects did not receive any further instructions during the experiment. Following the pre-session training, each subject worked on a multiple schedule with random-ratio (RR) and random-interval (RI) components. At periodic intervals, subjects interrupted work on the

schedule to complete guess sheets describing the schedules and received points contingent on the accuracy of guesses. To determine whether subjects' performance was contingency-shaped or rule-governed, point earnings were discontinued for guesses and schedule components were repeatedly reversed. Subjects exhibited rates of behavior which were consistent with the schedule in effect, and their performance appeared to be contingency-shaped. However, when multiple RR RI schedules were changed to multiple RI RI schedules, behavior did not conform to the scheduled contingencies, producing higher rates of responding than would be expected.

In the three studies discussed above, the effects of instructional control were markedly seen, even when instructions were of a nonverbal nature and were relatively brief. Matthews et al. noted that "insensitivity of human performance to schedule contingencies is not an inevitable consequence of instructions, but subtle and unrecognized aspects of instructional control may be involved in human performance whenever instructions of any kind are given..." (p. 465). Matthews et al. note that "...human behavior is not completely immune to the effects of schedule contingencies ..." (p. 466), and that "humans can also behave in other ways, of which pigeons are incapable" (p. 466), suggesting that the interaction between contingencies and instructions should be the subject of interest.

Levels V and VI on the AVC test may be measuring more than simple auditory–visual discriminations. These levels may be measuring more than the simple arbitrary discriminations investigated by Davine (1990), Wilson (1991) and Butler (1992). Pigeons can learn arbitrary discriminations with relative ease but may not be able to learn to behave under instructional control. If this is the case, the AVC test may be measuring some uniquely human behaviors.

Rule-Governed Behavior and the AVC Test

Subjects may be engaging in rule-governed behavior in levels V and VI rather than just responding to an auditory stimulus. Kerr et al. (1977) assumed that the student did not have to "...understand the concepts of can, box, or color to succeed" (p. 182). They have provided no data in support of this assertion. What they seem to be suggesting is that the subjects did not have a relevant history of reinforcement with respect to the vocal stimuli "can," "box," "yellow," and "red." In addition, subjects may be covertly answering the question "Where does it go?" in levels II through IV and the resulting covert response may be functioning as an instruction for the correct response. Butler (1992) noticed that some of his subjects overtly answered the question "Where does it go?" prior to making a response. The fact that the subjects were also looking at the stimuli carefully (Kerr, Meyerson & Flora, 1977) only suggests that the visual stimuli are important in making the correct response. It does not suggest that the visual stimuli are the only stimuli that are important in making the correct response.

Possibly the most important difference between all the experimental steps in Davine, Wilson and Butler's studies and levels II–IV is the lack of a specific auditory/vocal prompt (e.g., "Put it in the red box/yellow can") in levels II–IV. Previous studies in this area make very little mention of the possible conditioning history with respect to the auditory stimulus but that may be it's most important feature. The subject is given an instruction/rule and the requirements then become one of whether the rule is a significant discriminative variable, and whether the behavior specified in the rule is in the subject's repertoire. One of the characteristics of rule-governed behavior seems to be that most or all of its components are already in the behaver's repertoire. Under the control of

an instruction, the subject produces behavior which is a novel combination of those components and it therefore appears to be new behavior. In other words, the rule serves to evoke a new combination of previously learned components and therefore facilitates the rapid acquisition of a new response. For instance, no amount of rules can overcome the time required to learn to drive a car. Instruction certainly facilitates learning to drive but a certain amount of contingency shaping is also required. Many individual component behaviors are originally absent and must be contingency-shaped such as coordination of movements of the controls with appropriate reactions of the car. The subjects of the AVC test may be exhibiting rule-governed behavior in all levels but it is most relevant in levels V and VI. This observation would not be inconsistent with the finding of previous researchers. For instance, if the subjects make more than 8 cumulative errors, they will usually require many (≈ 500) trials to learn the task. If a subject did not have the components of a particular rule-governed behavior in his repertoire, it may take many trials to learn the task (e.g., driving a car).

If this is the case, then the auditory stimulus in levels V and VI may be an instruction which evokes RGB. In levels V and VI, it is possible that what is being tested is the ability to make a visual discrimination and a choice, putting the manipulanda in the red box versus the yellow can, under the control of an instruction. The auditory stimulus (instruction) may facilitate the learning process in the same way that any instruction facilitates learning a new behavior.

In Butler's (1992) study, all subjects but one failed step 9x in which they were required to make a discrimination based on what were intended to be novel arbitrary vocal stimuli. Yet all passed step 7x1 which included auditory stimuli that were not necessarily intended to be novel but were also arbitrary vocal stimuli. In other words,

step 7x1 was much easier than step 9x and utilized stimuli that could have been familiar, while step 9x was much more difficult and utilized stimuli that were highly likely to be novel. This suggests that the additional difficulty of step 9x compared to step 7x1 was due to the novelty of the stimuli used in 9x, since this was the most likely difference between the two conditions. Since Butler's step 9x was also clearly more difficult than AVC levels V and VI, which used stimuli with properties similar to those used in step 7x1, this suggests that the auditory stimuli used in the AVC levels may not have been novel. Moreover, it suggests that the specific auditory/vocal stimuli being used might have a profound effect on the behavior of subjects on AVC levels V and VI.

Summary of Issues Regarding AVC Extension

The forgoing discussion illustrates the complexity of the issues involved in the determination of the relevant discriminative variables in levels V and VI. As pointed out earlier, the complexity may increase in levels V and VI over lower levels because the subject must make the correct response under the control of both a receptive language variable and a visual or position variable. Several authors were cited earlier suggesting that in terms of the natural order of development of various repertoires in children, language development occurs immediately after match-to-sample, providing support for the receptive language variable. Casey & Kerr (1977) concluded that "...the acquisition of AVC skills appears closely associated with the upsurge, or rapid growth in speech that is so common in children between 2 and 3 years old." Additional research in the area of rule-governed behavior may suggest some of the variables that are involved in the control of behavior by vocal stimuli.

Completeness of the AVC Test — Adding New Levels

Many of the subjects in previous research on the AVC test have been evaluated as being severely retarded yet have passed all AVC levels including level VI. This suggests that the AVC test does not give enough information about higher skills that only moderately or mildly retarded subjects might have. The AVC test would be more comprehensive with higher levels such as VII, VIII and even IX and X. However, determining exactly what type of discrimination should be tested does not seem as straightforward as it was with the first six levels. Even determining what discrimination should be tested for a single step above level VI does not seem straightforward, so it might be useful to move forward only one level at a time.

In trying to determine a possible level VII, one or more of the experimental steps used by Davine, Wilson or Butler could possibly be used since they were more difficult than AVC level VI. However, the error pattern for the experimental steps in Butler's (1992) study was different than for the AVC levels suggesting some fundamental difference between his experimental steps and AVC levels. The experimental steps used by Davine and Wilson did not follow in the same spirit of the AVC test with simple stimuli and simple measurement techniques. The stimuli used by Davine were more complex than those used in the AVC test (e.g., a toy car, a troll doll), with each having many features, any one of which could have functioned as a discriminative variable. Wilson used a fading technique, which is not used in the AVC test, to teach the discriminations being tested. For these reasons, none of these previous discriminations seem suitable for a level VII.

Another problem with a level above AVC level VI is that eight cumulative errors

may be a poor criterion for failure, due to the increased complexity of behavior required for a correct response. If the earlier observations about the role of RGB and the AVC test are correct, then it is possible that some or all of the components of the behavior exhibited in levels VII and above are already in the subject's repertoire if they pass that level. The result is that several behaviors, rather than just a single discrimination as in the current AVC levels, must be previously learned to pass a level VII in only a few trials. For instance, if all the components of the behavior are in the subject's repertoire and the subject could make the receptive language discrimination, then the correct behavior could be learned quickly because of the facilitative function of the instruction. If only some components are in the subject's repertoire, it would be learned more slowly but possibly the number of trials would be between 8 and 100. If none of the components are in the subject's repertoire but the subject could make the appropriate receptive language discrimination, then many trials might be required to learn the components through contingency shaping, possibly 25–50 or more. If the components are in the subject's repertoire but the receptive language discrimination is not, the correct response might be learned after many more trials, possibly several hundred. If the components are not in the subject's repertoire and the subject could not make the appropriate language discrimination, then many more trials might be required to learn both the receptive language discrimination and the component behaviors, possibly thousands of trials. These situations would result in a different number of trials to learn the correct response from previous AVC levels, depending on what component behaviors were previously learned, necessitating a different criterion for the number of errors.

Because the complexity of language is so great and that appears to be the next major functional class of behavior to be learned after match-to-sample, the determination

of AVC levels above VI may itself become complex. Discriminations in all levels above VI will probably involve language in some way. Further, the traditional criteria for determining if a level is truly a hierarchical level within the existing test, such as the number of errors before failure and the number of trials to learn a failed discrimination, may have to be changed.

The various factors discussed above suggest that language and instructional control are important variables in the passage of AVC levels V and VI. Further, any AVC levels to be discovered above level VI are likely to also involve language and instructional control. It is in these areas that further research should be directed.

Rationale for the Current Research

The AVC test was originally developed 16 years ago and seemed quite promising as an assessment tool for the developmentally disabled. Yet, it has not come into widespread use with that population. The test is very useful in assessing the discrimination skills of developmentally disabled up through severe retardation. However, many in this category can pass all six AVC levels. The limitation of the AVC to assess discrimination skills in moderately or mildly retarded individuals may be one of the reasons for its lack of acceptance by those who routinely work with the developmentally disabled. If the AVC test is to become a useful assessment tool for this population, it should be applicable to a wider range of subjects, specifically to subjects including moderate and/or mild retardation. This would require new AVC levels above the current highest level, VI.

Criteria for a New AVC Level

In order to be consistent with the other levels on the AVC test, any new levels

that are higher than level VI should follow the same conceptual theme as levels V and VI in terms of the discrimination that is being made. This suggests that the discriminations made in the higher levels should be clearly more difficult than those in lower levels. The previous discussion suggested that the discriminations being tested in levels V and VI were partly receptive language discriminations. That aspect of the discrimination is what has been emphasized in the previous discussion, not because it was considered the most important discriminative variable in level VI but because it has been neglected by all previous researchers yet seems to be an important component in understanding the difficulty of levels V and VI. Each of the AVC levels parallels basic developmental skills, each of which is needed to function effectively in the context of the current social structure. Several lines of research have suggested that language development is the next big stage of development in children after match-to-sample tested in level IV. Since the current levels in the AVC test are based, at least in part, on developmental criteria, this avenue seems fruitful for determining any additional levels that might be added to the AVC test. Receptive language in particular would seem most relevant to a discrimination in a level above AVC level VI. However, within the framework of the severely to moderately retarded, the population most applicable to a new AVC level above level VI, attempting to determine a specific type of instruction to use for a discrimination test seems less relevant than looking at the discriminative variables which were operating in addition to any language discriminations being made. Butler's study (1992) suggested that a history of reinforcement with respect to the stimuli "box," "can," "yellow," and "red" which was also coincident with normal cultural practices, seemed to make the discriminations in levels V and VI much easier than if no such history was present. However, something about levels V and VI also made them more difficult than match-

to-sample, despite any facilitative effect due to a history of reinforcement with respect to the vocal/auditory stimuli. The critical discrimination may have been basic receptive language skills. Once this discrimination is acquired, additional variables may become important such as the complexity of behavior that can be controlled by an instruction.

In levels V and VI, the subjects were only required to respond to one category within one stimulus dimension for a correct discrimination (i.e., there were two stimulus dimensions, container type and color, and two categories within each stimulus dimension, box and can within container type, and red and yellow within color). For instance, subjects could give the correct response if they knew only "box" because if they were asked to put the foam in the can, putting it in the container that was not the box would still be correct. Similarly, they would not need to know red or yellow for a correct response since the can was always yellow and the box was always red. Even if they "knew" both categories within each stimulus dimension, they only had to respond to box versus can or yellow versus red to make the correct response. Despite the apparent simplicity of this discrimination, the data suggest that it is not easy for many subjects who can match-to-sample, supporting the notion that a receptive language discrimination must also be learned. Furthermore, while Kerr et al. (1977) suggest that combining auditory and visual stimuli as was done in level VI makes the discrimination more difficult, Butler's (1992) data suggest that the auditory-visual stimulus combination can be an easier discrimination than when the visual stimuli are used alone. The difficulty may be determined partly by the reinforcement history with respect to the auditory/vocal stimuli used and partly by the presence of a receptive language discrimination.

Kerr et al. suggested that it was the auditory discrimination in level V that made it more difficult than match-to-sample in level IV. This is probably correct as long as the

auditory stimulus is understood to be a vocal (language) stimulus which has a history of reinforcement for the particular subject, that may facilitate the correct response. Those who fail level V may be unable to learn the most basic language discriminations easily and in a consistent manner. Kerr et al.'s suggestion that the difficulty of level VI was due to combining the auditory and visual stimuli may have been incorrect. The previous discussion in combination with the data from Butler's study suggest that level VI was more difficult than level V because of the absence of position stimuli that were present in level V. In this regard, level VI is seen as more difficult than level V for the same reason that level III is more difficult than level II.

The difficulty of levels V and VI seems to be a result of the complex interaction of the vocal/auditory stimuli and the visual discrimination. To better understand this problem, it may be easier to look at what is involved in a receptive language discrimination. In levels V and VI, the subject must be able to make the correct response under the control of specific stimuli, the vocal (auditory) stimuli "red," "yellow," "box" and "can," or at least any one of these stimuli. The subject must also be able to make the correct response under the control of the visual stimuli red, yellow, box and can or any one of these stimuli. If the subject's behavior can be controlled by the vocal stimulus "red," then the subject's behavior can also be controlled by the visual stimulus red. Similarly, if the subject's behavior can be controlled by the vocal (auditory) stimulus "can," then his/her behavior must also be controllable by the visual stimulus can. This is implicitly an auditory–visual discrimination. If the vocal stimulus was "salty taste," then the subject's behavior would have to be controlled by the vocal (auditory) stimulus "salty taste" and the gustatory stimulus salty taste, requiring an auditory–gustatory discrimination. If the vocal stimulus was "music," then the subject's behavior would have to be controlled by

the vocal (auditory) stimulus "music," and the auditory stimuli of music and non-music, making an auditory–auditory discrimination. These double discriminations are inherent in all receptive language discriminations.

Possible Discriminations in a New Level

The foregoing discussion suggests that the difficulty of levels V and VI is due to the nature of a receptive language discrimination rather than being due specifically to a combination of auditory and visual discriminations. In other words, any receptive language discrimination, regardless of the stimulus mode (e.g., visual, auditory, gustatory, olfactory or tactile) might possess a similar level of difficulty. If this is the case, then levels V and VI may be testing the most rudimentary receptive language discriminations. Higher AVC levels should then test more complex receptive language discriminations.

In trying to devise a more difficult discrimination than level VI, it is tempting, based on the earlier discussion of the possible importance of language in higher level discriminations, to manipulate the vocal stimuli, somehow increasing their complexity. However, in level VI, the vocal stimuli are at the most basic level. Subjects need only respond to single words like "red," "yellow," "box," and "can" to pass those levels. One of the most useful functions of instructional control is to facilitate rapid new learning. Given the typically slow learning process of developmentally disabled subjects, this may be its most important function. However, the verbal repertoire of developmentally disabled subjects is typically very limited, reducing the possibilities for designing complex vocal stimuli that would facilitate complex behaviors. It seems that a more useful approach would be to manipulate the visual stimuli used in level VI in some way. Furthermore, the change should be substantively different and in a direction that parallels the

requirements of responding to adaptive new skills.

Increasing the complexity of the visual stimuli used in level VI from one to two simultaneous stimulus dimensions would be a logical extension to the discrimination being tested in level VI. The subject would be required to choose an object on the basis of both container type and color at the same time. For instance, there would be both red and yellow boxes, and both red and yellow cans for a total of four containers. Subjects would be told to put the foam in the red box, yellow box, red can, or yellow can. However unlike level VI, subjects must attend to both container type and color to make a correct response. The instruction provided would be of slightly greater complexity than that used in levels V and VI. However, if the required receptive language discrimination was present, it could provide the same facilitative effect that was suggested in Butler's study, making an otherwise difficult discrimination easier. The extra difficulty of this discrimination would be provided mostly by the requirement of the subject having to attend to both color and container type at the same time to make the correct response, and possibly to the use of four simultaneous containers rather than two.

In order to ensure that subjects could respond appropriately to each stimulus dimension individually, a pretest could be given in which subjects would be asked to point to several objects including red and yellow objects, and several boxes and cans. A variety of objects could be used to ensure subjects were responding to the concepts rather than just to individual stimuli. This would ensure generalization to the experimental stimuli. Since all subjects would have passed level VI, this would also provide some information about whether subjects who pass level VI typically "know" these four stimulus qualities. If subjects could not pass this pretest, they could be given training designed to strengthen these simple discriminations.

METHOD

Subjects

Seventeen subjects were recruited from the Center for Developmentally Disabled Adults (CDDA) in Kalamazoo Michigan, which is affiliated with Western Michigan University. This center has four facilities with clients having a variety of disabilities, and retardation ranging from moderate to profound. Twelve subjects were recruited from the Pleasant Avenue facility, three from the Patterson facility, and two from the West Main facility. The facilities provide a day school setting where clients are taught a range of skills from vocational to basic self care needs. Subjects ranged in age from 26 to 72 and in level of retardation from moderate to severe.

Subject selection was based on several criteria. It was desirable that subjects pass AVC level VI. A suggested list of subjects was prepared by a collaboration of several of the staff at CDDA based on the need to pass at least AVC level IV. This avoided the need for actual testing of all CDDA clients. Next, many subjects on that list were given the AVC test during a previous study (Butler, 1992) and only those who passed at least AVC level IV were be used as subjects in this study. In actuality, all of the subjects who were tested previously and passed level IV also passed level VI. Because one year had passed since this was done, further consultation with CDDA staff was performed and resulted in additional subjects being added to the list. However, all subjects had to pass the same selection criteria that were used with previous subjects before being used in the present study. Seventeen subjects were used in the current study.

Approval was obtained from Western Michigan University's Human Subjects Institutional Review Board, and from the Kalamazoo County Human Subjects Review Board.

Setting

Subjects were tested at the CDDA facility they normally come to each day, and during experimental sessions they remained in or near the location where they normally worked.

Procedure

One experimental step was added to the six levels in the AVC test, which was designed to be more difficult than the existing level VI, and which is described below. The order in which the experimental steps were administered may have been important to the outcome. For this reason, the new experimental step was administered after AVC level VI.

Reinforcement for a correct response consisted of verbal praise which was given for each correct response. In addition, some subjects received backup reinforcers consisting of food, drink and pennies. At the Pleasant Avenue Center, most CDDA participants normally don't receive food or drink as reinforcement for correct responding during their training but always receive verbal praise. In order to be consistent with the procedures used at CDDA, all subjects at the Pleasant Avenue Center except one received only verbal praise as reinforcement for a correct response. One subject at the Patterson Center received a few small pieces of sugarless candy at the completion of her participation in a session at the suggestion of one of the CDDA staff. One subject at the West Main

Center received pennies, at the suggestion of one of the CDDA staff. In preliminary testing, subjects at the other centers received occasional reinforcement of food, drink or other items such as gum or stickers which had been suggested by the staff at CDDA as effective with that particular client and which had been approved by the staff at CDDA so as not to cause any difficulties with food allergies or conflicts with normal CDDA procedures.

A New AVC Level VII

This step was intended to be more difficult than AVC level VI while having characteristics similar to the other AVC levels such as the same error pattern (i.e., subjects who pass usually make less than 5–6 errors but subjects who fail require 500–1000 trials to pass, if they are able to pass at all). Many subjects who are classified as severely retarded had passed level VI in previous studies. A desirable goal was that substantially fewer subjects who have been classified as severely retarded should pass a level VII than could pass level VI. A level VII should be more difficult than level VI in the same fashion that all AVC levels are more difficult than earlier levels.

Preliminary Testing/Training

All subjects were given a test in which they are asked to identify a variety of objects by pointing to the named object. All these objects had one of the four following properties: red in color, yellow in color, a square box, a round can. A variety of different shaped objects were used including spherical, conical and rectangular. There was some variability in the properties of these objects to ensure that subjects would be able to generalize from the test objects to the experimental objects used later in the study.

Subjects were asked to point to the red object, yellow object, box, and can.

One subject passed level VI but failed this pretest. A training session was utilized, using the same objects used in the pretest, to attempt to increase competency in making discriminations among these four concepts. The subject was asked to point to an object and was reinforced with verbal praise (and an occasional piece of sugarless candy on a VR8 schedule) for the correct response. Competency was the same as that used for passing an AVC level: the subject had to make eight consecutive correct responses.

A typical training session took the subject through all the AVC levels and the experimental step to passage or failure, and lasted about 30-35 minutes. Subjects who failed the experimental step were retested at later dates for about 30-40 minutes each session, for up to 15 additional sessions for one subject, until the error trials for that subject were completed. On a few occasions a subject exhibited signs of boredom or lack of interest on training sessions and the session was terminated for that day after about 15–20 minutes and resumed at another time.

A Multidimensional Discrimination

Experimental Step

Because the order of administration of AVC levels might be important to the outcome, subjects were tested on the six levels of the AVC test and then the new experimental step, in that sequence. In the experimental step, subjects were asked to put the foam in the red box, red can, yellow box, or yellow can. All four containers were on the table in front of the subject. The position of the containers was changed for each trial, according to a predetermined random pattern on the score sheet. Icons were used on the

score sheet to indicate specific containers and their arrangement. Containers were placed up against an upside down (to hide the normal markings from view) yardstick which had marks for the position of each container, to reduce the chance of placing any one container closer to the subject than another, or any one container closer to another container than the others. Criterion for passage and failure was be the same as that used on the AVC test: the subject was required make eight consecutive correct responses for passage and eight cumulative errors for failure.

The containers used in this step were slightly different from those used in previous AVC levels. One pound coffee cans were used which measured 5 cm wide by 14 cm tall, and the boxes were slightly smaller, 13 cm square. In addition, the "red box" used in this step was not the same as the red and white striped box used in earlier levels of the AVC test. In all previous studies, the red and white striped box was referred to as the "red box." However, to reduce the possibility of any ambiguities, an all-red box was used in this step.

Failure to Make the Discrimination

In previous work (Kerr, Meyerson & Flora; 1977), among 10 children who failed a level, informal attempts to teach a simple discrimination at that level required 100–900 trials. No special techniques were used to speed the learning process in that study aside from some prompting and fading. Subsequent studies (Meyerson & Kerr, 1977; Wilson, 1991) have demonstrated that a failed discrimination could be learned significantly more quickly using special techniques. However, the requirement of 100–900 trials to learn the discrimination, when no special techniques are used, can be used as an indicator that a potentially new AVC level does seem to fit the criteria set by previous authors for

inclusion of a discrimination test in a hierarchical system in which each level is substantially more difficult than previous levels. At the same time, most subjects who pass a level make no more than 5–6 errors, while 2–3 is more typical. In many learning situations, 25–50 trials is more than adequate. Consequently, testing for failure with as many as 900 trials is probably overly conservative. More importantly, subjects may become bored after as few as 50–100 trials when their error rate is high and the reinforcement rate, for reinforcers such as food and drink, is low. Consequently, a maximum if 200 trials was used instead of 500–1000 to test for a failed discrimination. With some subjects, more trials were used to get a feel for just how difficult the discrimination was. With one subject 384 trials were used in an attempt to teach the failed discrimination.

When a subject failed the experimental step, using the same failure criteria as used on the AVC test (see Appendix A), testing was continued with that subject until either the discrimination was learned or until the subject completed at least 200 trials. The procedure for this testing was identical to that used prior to failure. Some special training techniques were used with one subject to see if that subject could learn the correct response in less than 200 trials. Training consisted of asking the subject to first find only a can or box while all four containers were present, then adding color so that the final discrimination was the same as that used for all other subjects.

In order to get a better understanding of the difficulty of the failed discrimination, some subjects received extra training trials. Some of these subjects received some of the extra trials using fading (Whaley & Malott, 1970) techniques designed to facilitate the learning process. Fading was only instituted after the subject had completed the first 200 trials without any special techniques being used.

RESULTS

All 17 of the subjects actually used in this study were able to pass all levels on the standard AVC test except one as noted below. Two potential subjects refused to participate in the experiment and were not tested at all. Another potential subject was not refusing but was not cooperating either, so testing was terminated before completion.

The results of preliminary testing for the concepts of color and shape were generally very good. All the subjects except one, #65 passed. Subject #65 was unable to make the correct response when the controlling stimuli were the colors red and yellow but was able to make the correct response when the controlling stimuli were the shapes box and can. An attempt to teach color discrimination to this subject using fading techniques with red and yellow only, also failed after 100 trials. A fading procedure that was more gradual might have succeeded but this would have required the production of additional materials and would have been somewhat time consuming. This did not seem justified for a single subject. Of the subjects who passed, all but one passed without error. Subject #74 passed with two errors. It was unclear whether subject #35 passed this test because she would always pick up both objects and hand them to the experimenter.

On the experimental step, all subjects who did not pass using the standard criteria for passing an AVC level, were tested until they passed or until they completed at least 200 trials, regardless of the number of errors. Using the standard criteria, eight of the seventeen subjects passed the experimental step. One subject passed after eight errors, another passed after nine errors and two subjects passed after making considerably more

than eight consecutive errors but fewer than 200. Subject #203 passed after 64 trials and subject #85 passed after 120 trials.

Subject #65, who failed the color portion of the preliminary testing also failed the experimental step. Testing was discontinued after only 25 trials because she was continuing to make errors on the color discriminations at the same rate throughout. Subject #69 failed levels III and IV but passed all higher levels including the experimental step (after 8 consecutive errors). The remaining four subjects failed after more than 200 trials each. Subject #87 failed after 281 trials, #61 after 240 trials, #54 after 384 trials, and #35 after 222 trials. These subjects were tested for more than 200 trials to get a better idea if any of them could learn the discrimination. The error rate was not decreasing significantly with these subjects at the completion of the test. Table 1 provides a summary of the results across all subjects.

With one subject who failed, #87, some of the error trials involved some training techniques to see how easily he could learn to make the discrimination, if at all. This subject completed approximately 200 training trials of the total 281 trials without a reduction in error rate. The subject would sometimes select a box when asked to find a can, so this did not seem to be helping. Using only a can and box and asking to select a can or box resulted in the correct choice each time. This suggests that it was the four containers that the subject had to select from that was causing the difficulty.

Table 1

Pass/Fail and Summary of Errors

Subject #	Preliminary Test	Errors	Experimental Step	Error Trials
81	Pass	0	Pass	9
65	Fail	100	Fail	25
75	Pass	0	Pass	1
115	Pass	0	Pass	0
69	Pass	0	Pass	8
48	Pass	0	Pass	0
87	Pass	0	Fail	281
74	Pass	2	Pass	2
61	Pass	0	Fail	240
108	Pass	0	Pass	0
54	Pass	0	Fail	384
38	Pass	0	Pass	0
70	Pass	0	Pass	1
200	Pass	0	Pass	0
85	Pass	0	Pass	120
203	Refused		Pass	64
35	Unclear		Fail	222

DISCUSSION

In general, the error pattern of the experimental step was similar to results obtained with previous research on the AVC test. That is, four of the seventeen subjects failed the experimental step and still had not learned the discrimination after hundreds of trials. However, there were some anomalies. Subject #69 passed after 8 consecutive errors but also failed levels III and IV. Subject #81 failed after 9 consecutive errors. One possible explanation may be that she was sometimes engaging in other behaviors during testing like singing, talking, looking around and drinking coke and coffee. These behaviors may have interfered with her attention and led to a greater number of errors. Subject #203 seemed to have higher level skills (e.g., could write his name and was his own guardian) and I was surprised with the high error rate (64 errors). However he made seven errors on level 4 which cannot be accounted for. Other variables were that he was very overweight (about 400 pounds), it was hot when tested, and he chose to stand because there was not a chair he wanted sit in due to his weight. Subject #85, who passed after 120 errors, exhibited some possible attentional anomalies. For instance, sometimes he would not respond right away but would look like he was falling asleep. During one testing session he got fifteen consecutive correct responses then made 11 errors. This subject suffered from epilepsy and may have been having some mini-seizures during testing.

These results suggests strongly that this experimental step fits the criteria for an AVC level, specifically one that falls just above level VI. It was clearly more difficult than

level VI for four subjects who were not able to learn the discrimination after more than 200 trials. Most of the subjects who passed the experimental step did so with less than eight consecutive errors. The anomalies noted may have been due to the explanations provided.

On the other hand, the additional complexity of new AVC levels above VI may lead to results that differ significantly from previous results. This author previously suggested that any AVC level above level VI would necessarily be a double discrimination involving an auditory/vocal stimulus and some additional stimulus. Additional conditioning variables for each discrimination could further complicate the results.

Since all subjects in this study were able to pass levels V and VI, they were able to make an auditory/vocal discrimination. The auditory stimulus used in the experimental step was not more complex nor was it qualitatively different from the one used in levels V and VI. The subjects had to make a more difficult visual discrimination based on two stimulus dimensions at the same time, color and shape. The experimental step should be named the "auditory 2-dimensional, visual discrimination." The additional testing performed with subject #87 suggests that the presence of four containers rather than two made the visual discrimination more difficult, at least for that subject.

Conclusions

Much material was covered in an attempt to determine what variables should be considered in creating a discrimination that could make a potential level VII. In the process, some issues have come to light regarding the role of receptive language in additional levels above level VI. The conclusion that increasing the complexity of the visual discrimination in a level VII rather than increasing the complexity of the auditory

discrimination seems to have been valid. In this regard, the experimental step in this study seems to extend the discrimination being made in levels V and VI in qualitatively the same direction. In other words, the experimental step extends the difficulty of the discrimination made in level VI in the same way that level VI extends the difficulty over level V. However, for additional levels above the experimental level in this study, it is not clear what discrimination would be best.

In an attempt to answer that question, some informal testing was done with some subjects using an alternative discrimination. For instance, only a few trials of each type were performed, especially if the subject was making errors consistently. In level V, subjects must make a position discrimination but the position is absolute. That is, the container is always in the same position. One possibility might be that a relative position discrimination would be more difficult than an absolute one. Based on that assumption, two objects were placed in front of the subject and the subject was asked to put an object on top of, under, to the left or right of, behind or in front of the other object. Seven subjects were tested in this manner. Three of these subjects passed easily who also passed the experimental step. Two subjects failed, one of whom also failed the experimental step. One subject passed only one dimension, higher versus lower, who passed the experimental step after 120 errors. One subject failed this test who passed the experimental step. In general then, this step seems about as difficult as the experimental step. However, this step required both a qualitatively different auditory/vocal stimulus and different visual stimuli than the experimental step. Subjects had to make the correct response under the control of the stimuli “Left,” “Right,” “In front of,” “Behind,” “On top of,” and “Under,” making this a more complex, or at least different auditory discrimination, as well as having to make the relative position discrimination. For instance, the

subject was handed a red can, given the stimulus "Left," while one red can was already on the table. The correct response was to place the red can to the left of the one on the table. The determination and use of this informal test gives some idea of the difficulty encountered in trying to decide what discrimination is appropriate for AVC levels above VI.

Changing the auditory stimulus in potentially higher AVC levels may simply be testing the subject's reinforcement history with respect to those stimuli rather than testing a new discrimination level. However, the subject might be required to make more complex auditory, visual or other discriminations in the process of being given a different auditory/vocal discrimination. For instance, the subject might be handed two objects and told to put one object in the red box and the other in the yellow can. Another possibility might be to hand an object to the subject and tell him/her to put it in the red box if it is square or the yellow can if it is round. It will not be immediately clear in these cases, exactly what discrimination is being made. In the first case, it might be a more complex receptive language discrimination. In the second case, it could be a more complex receptive language discrimination and/or a shape discrimination.

These examples illustrate the difficulty in understanding the role of receptive language, instruction following, and rule governed behavior in making a specific response. In the process of developing higher AVC levels, we may come to better understand these processes.

APPENDICES

Appendix A

Summary of Learning-to-Learn Tasks

TABLE 1

Summary of Learning-to-Learn Tasks

Task	*Visual S^Ds (Containers)*	*Position of Containers*	*Correct Response*	*Auditory S^Ds**	*Manipulanda*
I. Imitation	1 at a time	1 in front of subject	a) Put foam in can (2 trials) b) Put foam in box (2 trials) c) Put cube in box (2 trials) d) Put cylinder in can (2 trials)	"Put it in"	rubber foam, cylinder, cube
II. Position Discrimination	2	2 containers in front of child *stable* position	Puts the foam in the yellow can	"Where does it go?"	neutral (rubber foam)
III. Visual Discrimination	2	*alternate* position *randomly*	Puts the foam in the yellow can	"Where does it go?"	neutral (rubber foam)
IV. Match-to-Sample	2	*alternate* position *randomly*	a) Puts the yellow cylinder in the yellow can b) Puts the red cube in the red box	"Where does it go?"	a) Yellow cylinder b) Red cube
V. Auditory Discrimination	2	*stable* position	a) Puts the foam in the yellow can b) Puts the foam in the red box	a) "Put it in the yellow can." b) "Put it in the red box." (presented *randomly*)	neutral (rubber foam)
VI. AVC Auditory-Visual Combined Discrimination	2	*alternate* position *randomly*	a) Puts the foam in the yellow can b) Puts the foam in the red Box	a) "Put it in the yellow can." b) "Put it in the red box." (presented *randomly*)	neutral (rubber foam)

Note: During the demonstration phase, no reference should be made to the red box or yellow can in levels II through IV. For levels II and III, say *"Now I'll put it in here."* For level IV, make comparisons between the object and the container. Begin scoring after the subject has successfully placed the object in the correct container.

Correction Procedure

1. The experimenter says: "No, that's not the ______. This is the ______." The subject is physically guided in making a correct response if needed.
2. The experimenter says: "Now do it all by yourself. Put it in the ______."
3. A successful correction trial is not counted as a correct trial but an error on a correction trial is counted as an error.

Pass = 8 consecutive correct trials
Fail = 8 cumulative incorrect trials

TABLE 2

Summary of Learning-to-Learn Experimental Tasks

Task	*Visual S^Ds (Containers)*	*Position of Containers*	*Correct Response*	*Auditory S^Ds**	*Manipulanda*
1A: Four containers and two stimulus dimensions	4	4 containers in front of child *alternate* position *randomly*	Puts the foam in the instructed container	"Put the white foam in the (yellow can/red box/yellow box/red can)"	Neutral (rubber foam)
1B: Four containers and three stimulus dimensions	4	4 containers in front of child *alternate* position *randomly*	Puts the foam in the instructed container	"Put the white foam in the (yellow can/red box/yellow box/red can)"	Neutral (rubber foam)

Appendix B

Data Recording Forms

DATA RECORDING FORM — Experimental Task

Learning To Learn—Red, Yellow, Can, Box

Name ______________________________ Time Start__________________
Teacher ______________________________
Finish __________________
Date ______________________________

Instructions: If the response is correct, circle the trial number. If the response is incorrect, place X on trial number. The task is complete when eight (8) consecutive correct trials are made. Discontinue when eight (8) errors have accumulated. Errors that occur as part of correction trial (see procedures) should be underlined, X. If a child corrects an error during a correction trial, do *not* record a correct trial.

Stimulus Dimension Test

Correct stimulus is the one you ask for as indicated below.

Trials:

↓**gBox gCan**	↓**Rcon Ycon**	**wBox** ↓**gCan**	↓**Rbal Ybal**	**gBox** ↓**sCan**	↓**wBox sCan**	**Rcon** ↓**Ycon**	↓**Rbal Ycon**
——>1	——>2	——>3	——>4	——>5	——>6	——>7	——>8
Rbal ↓**Ycon**	↓**gBox gCan**	↓**wBox gCan**	**gBox** ↓**sCan**	↓**Rbal Ycon**	↓**wBox gCan**	↓**Rbal Ybal**	**Rbal** ↓**Ycon**
——>9	——>10	——>11	——>12	——>13	——>14	——>15	——>16
↓**gBox gCan**	↓**wBox gCan**	**wBox** ↓**sCan**	↓**gBox sCan**	**wBox** ↓**gCan**	**Rcon** ↓**Ybal**	↓**wBox sCan**	↓**gBox sCan**
——>17	——>18	——>19	——>20	——>21	——>22	——>23	——>24
gBox ↓**gCan**	**Rcon** ↓**Ybal**	**wBox** ↓**gCan**	**Rcon** ↓**Ybal**	**Rbal** ↓**Ycon**	**Rcon** ↓**Ybal**	↓**Rcon Ycon**	**gBox** ↓**gCan**
——>25	——>26	——>27	——>28	——>29	——>30	——>31	——>32
wBox ↓**sCan**	**wBox** ↓**gCan**	**gBox** ↓**sCan**	↓**Rcon Ybal**	↓**Rbal Ybal**	**gBox** ↓**gCan**	**wBox** ↓**gCan**	**gBox** ↓**gCan**
——>33	——>34	——>35	——>36	——>37	——>38	——>39	——>40
wBox ↓**sCan**	**Rbal** ↓**Ycon**	↓**wBox sCan**	**Rbal** ↓**Ycon**	**Rcon** ↓**Ycon**	**Rbal** ↓**Ybal**	↓**wBox gCan**	**Rcon** ↓**Ybal**
——>41	——>42	——>43	——>44	——>45	——>46	——>47	——>48

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Notes:

Rcon Ycon = Red cone, Yellow cone; **Rcon Ybla** = Red cone, Yellow ball; **Rbal Ycon** = Red ball, Yellow cone
Rbal Ybal = Red ball, Yellow ball; **wBox sCan** = white Box, silver Can; **wBox gCan** = white Box, gold Can
gBox sCan = gold Box, silver Can; **gBox gCan** = gold Box, gold Can;

DATA RECORDING FORM — Experimental Task

Learning To Learn — Four Containers, Alternate Randomly

Name ______________________________ Time Start____________________

Teacher ______________________________

Finish ____________________

Date ______________________________

Instructions: If the response is correct, circle the trial number. If the response is incorrect, place X on the trial number. The task is complete when eight (8) consecutive correct trials are made. Discontinue when eight (8) errors have accumulated. Errors that occur as part of correction trial (see procedures) should be underlined. If a subject corrects an error during a correction trial, do *not* record a correct trial.

*Task #*________(Experimental)

Correct stimulus is the one you ask for as indicated below. (Containers alternate randomly.)

Trials:

1	Ⓡ	$\boxed{R}$	Ⓨ	↓ $\boxed{Y}$
2	$\boxed{R}$	$\boxed{Y}$	↓ Ⓡ	Ⓨ
3	Ⓡ	Ⓨ	↓ $\boxed{R}$	$\boxed{Y}$
4	Ⓡ	↓ Ⓨ	$\boxed{Y}$	$\boxed{R}$
5	Ⓨ	↓ $\boxed{R}$	Ⓡ	$\boxed{Y}$
6	Ⓨ	↓ Ⓡ	$\boxed{R}$	$\boxed{Y}$
7	Ⓨ	Ⓡ	↓ $\boxed{Y}$	$\boxed{R}$
8	↓ Ⓨ	$\boxed{Y}$	Ⓡ	$\boxed{R}$
9	$\boxed{R}$	↓ Ⓨ	Ⓡ	$\boxed{Y}$
10	↓ $\boxed{R}$	Ⓨ	$\boxed{Y}$	Ⓡ
11	$\boxed{R}$	↓ Ⓡ	Ⓨ	$\boxed{Y}$
12	$\boxed{R}$	$\boxed{Y}$	↓ Ⓨ	Ⓡ
13	Ⓨ	$\boxed{Y}$	$\boxed{R}$	↓ Ⓡ
14	↓ $\boxed{Y}$	Ⓡ	Ⓨ	$\boxed{R}$
15	Ⓡ	↓ $\boxed{Y}$	$\boxed{R}$	Ⓨ
16	$\boxed{Y}$	$\boxed{R}$	↓ Ⓡ	Ⓨ
17	$\boxed{R}$	Ⓡ	↓ $\boxed{Y}$	Ⓨ
18	$\boxed{Y}$	↓ Ⓡ	$\boxed{R}$	Ⓨ
19	Ⓡ	$\boxed{R}$	$\boxed{Y}$	↓ Ⓨ
20	↓ $\boxed{Y}$	$\boxed{R}$	Ⓨ	Ⓡ
21	$\boxed{Y}$	Ⓨ	Ⓡ	↓ $\boxed{R}$
22	↓ $\boxed{Y}$	Ⓨ	$\boxed{R}$	Ⓡ
23	↓ Ⓨ	$\boxed{R}$	$\boxed{Y}$	Ⓡ
24	Ⓡ	↓ $\boxed{Y}$	Ⓨ	$\boxed{R}$

Notes:

Appendix C

Research Protocol Approval

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

Date: December 18, 1992

To: Chuck Butler

From: M. Michele Burnette, Chair M. Michele Burnette gks

Re: HSIRB Project Number 92-12-01

This letter will serve as confirmation that your research protocol, "An extension to the AVC Discrimination Test by the addition of one or more levels above AVC Level VI" has been approved after full review by the HSIRB. 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 approval application.

You must seek reapproval for any change in this design. You must also seek reapproval if the project extends beyond the termination date.

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

Approval Termination: December 18, 1993

xc: Michael, Psychology

KALAMAZOO COUNTY GOVERNMENT

HUMAN SERVICES DEPARTMEN

201 WEST KALAMAZOO AVENUE • KALAMAZOO, MICHIGAN 490(
PHONE (616) 384-8000

DR. A. ROGER VANDER SCHIE, Director

June 2, 1993

Mr. Chuck Butler
4523 West Main, Apt. A33
Kalamazoo, MI 49006

Dear Chuck:

I have received your kind reminder concerning your research study. I have received your revisions. I have also informed Dr. Vander Schie that your revisions bring you into compliance with recommendations. Your project is approved and you may commence implementation. Good luck to you!

Sincerely,

Patricia Baker

Patricia Davis Baker
Recipient Rights Officer

PDB/cd

Providing Mental Health, Public Health, Substance Abuse, Job Training, Transportation and Serves as the Community Action Agency.

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