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ABSTRACT

Reviewed are some of the most effective behavior modification techniques for use with learning-disabled (LD) children. Compared are the medical, psychometric, and behavioral models of LD; and discussed are the criteria used for classifying LD. Principles of applying motivational techniques such as selecting an effective reinforcer, are considered. An example of a successful behavior modification teaching program which increased on task time of LD students through use of teacher attention as a reinforcer is presented. Also examined are methodological considerations of the behavioral model including selection of research design and the application of statistical procedures such as the analysis of variance using multiple regression. (DB)

A Critical Review and Discussion of Behavior Modification Techniques for Treating Individuals with Learning Disabilities

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Presented at the 1975 International Federation of Learning Disabilities

Brussels, Belgium

A Critical Review and Discussion of Behavior Modification Techniques for Training Individuals With Learning Disabilities[1]

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ABSTRACT--This paper presents an overview of some of the most effective behavior modification techniques for dealing with individuals who have learning disabilities. The paper was organized into five sections: 1. a brief discussion of the medical, psychometric and behavioral models; 2. a discussion of the criteria used for classifying learning disabilities and the effectiveness of behavior modification procedures; 3. a discussion of motivational techniques found effective for people with learning disabilities; 4. an example of a successful behavior modification teaching program; and 5. a discussion of the methodological considerations of the behavior modification research model.

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[1]The authors would like to acknowledge the help of Mrs. Diane Vukovich and Richard Sutton for their aid in locating and reviewing articles and their critical comments.

Introduction

One of the major concerns of many of our school systems is identifying and dealing with children who have learning disabilities. The schools use a wide variety of diagnostic tests which for the most part confirm what the teachers already know. However, these tests tend to shed little light on the type of learning situation that will provide the most conducive atmosphere for these children to thrive. They also give the teachers little if any help in determining an effective and practical approach for meeting the students' needs.

One technique that has claimed great success in providing the teacher with procedures for working with and helping people with learning disabilities become more effective learners is behavior modification.

The purpose of this presentation is to review the behavior modification literature as it specifically relates to the training of individuals with learning disabilities. This review is not totally comprehensive but rather articles were selected to identify a variety of techniques and procedures that have been reported as successful or unsuccessful for dealing with learning disabilities.

The presentation is organized in the following manner:

1. a brief discussion of the medical, psychometric, and behavior models

2. a discussion of the criteria used for classifying learning disabilities and the effectiveness of behavior modification procedures

3. a discussion of motivational techniques found effective for individuals with learning disabilities

4. an example of successful behavior modification teaching programs

5. a discussion of the methodological considerations of the behavior modification research model.

It will conclude with a brief summary.

Medical, Psychometric and Behavioral Models

One of the major difficulties in dealing with children who have learning disabilities is the traditional method of classifying them using a "medical or psychometric model". A major characteristic of the medical model is the assumption that the cause of the disorder is physiological and the manifested behaviors are the symptoms of the physical cause. This approach has often led to erroneous conclusions which tend to propagate themselves. For example, if a student has a record of poor academic performance, this model may assume he has a physiological or psychological impairment which is effecting his ability. Poor performance would be the external symptoms of the internal cause. A student who daydreams and has a repertoire of bizarre behavior while seemingly impervious to external stimuli may be labeled autistic. While this label serves to pigeonhole the child, it does little to correct the situation. The label does, however, tend to inhibit one from searching for other causes of the behavior. It also creates confusion because there is no reliable criterion for labeling.

This problem has been somewhat alleviated by the psychometric model which produces highly reliable labeling and classification procedures. However, this very strength may create another problem. It tends to lead one to believe the classification system is valid and useful because it is reliable. But, like the medical model, it too tends to inhibit one from searching for other causes of the behavior or from seeking procedures for intervention that would modify the behavior and help the individual.

In contrast with the so-called medical and psychometric models, is the behavioral analysis model. This model defines the individual's problem in terms of his manifested behavior. No causal inference is inferred to underlying or unobservable hypothetical constructs. It assumes the individual's behavior can be predicted and controlled by events in the immediate surroundings. In other words, the behavior analysis model assumes that there are reinforcers in the external environment that are being applied systematically, and that these reinforcers are maintaining the individual's behavior. This model then will search for these reinforcers and use them to modify the deviant behavior.

The behavioral analysis model follows a systematic procedure.

1. State the problem in observable and measurable (behavioral) terms. For example, if a student is not attending to his school work assignment, it does not assume he is mentally retarded but rather the model defines the problem in terms of the student's rate of attending (base line data).

2. Analyze the defined behavior into its antecedents and consequences. This procedure is referred to as functional analysis.

To do a functional analysis the data must be collected in the natural setting in which the behavior occurs. The observer must carefully look for events immediately preceding and perhaps triggering the specific behavior identified in Step 1. For example, does the student become less attentive when someone enters the room? The observer must also identify what reinforcers (consequences in the environment) are acting to maintain the unwanted behavior. Does inattention get the child more teacher or peer attention than if he were working?

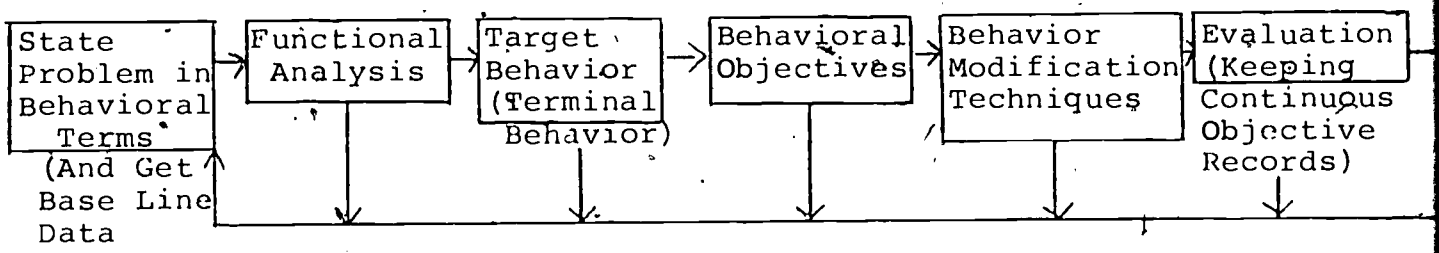
3. Identify the target behavior. This is related to Step 1 in which the problem is stated; however, in this third step one focuses on certain, specific aspects of the behaviors. Again returning to the inattentive student, since not attending can cover a wide range of situations, one may decide to begin with getting the student to attend to a task when working with the teacher in a small group session. This, then, would be the target behavior.

4. Specify the behavioral objectives. Further specify the target behaviors by stating the performance, conditions and criteria (behavioral objectives). Given the target behavior in Step 3, one specific objective may be: The student, when given a task by the teacher, will look at the appropriate material for 30 seconds. These objectives should be written sequentially and may begin as simply as just having the student look up when the teacher calls his name.

5. Develop and apply the modification strategy. To achieve the objective stated in Step 4, incorporate the well established

learning principles of the behaviorist, such as reinforcement, shaping, extinction, cueing, punishment, etc. This step uses the information previously gathered by the functional analysis.

6. Evaluation. After the other five steps are completed the behaviorist then looks at his data to determine if his objectives were achieved. If they were, fine. If not, he would repeat part of or all of the procedure. Therefore, evaluation is not a final step but rather a part of a continuous process. Below is a schematic representation of this procedure. One should note that there is a continuous feedback loop between components. Therefore, one may go from Step 1 to Step 2 and then back to Step 1 to restate the problem. One would then re-examine the functional analysis in Step 2 before proceeding to Step 3.



As one can see from the above presentation, a behavioral analysis approach to a learning disability problem incorporates in its definition potential solutions to the problem. This technique is also a diagnostic approach because it analyzes the problem into component parts which can then be more effectively handled; and finally, like the scientific method, the feedback loops provide a means of self correction.

Classification of Learning Disabilities and Effective Behavior Modification Procedures

There are two basic criteria for evaluating and classifying the degree of one's learning disability. The first criterion, cognitive skills, is generally measured by some type of intelligence testing procedure. The second criterion, one's ability to function in society, has been generally estimated by the Vineland Social Maturity Scale. This scale, like other psychometric approaches, can be legitimately criticized because it is heavily biased in terms of cultural experiences. (Barrett and Lindsley, 1962)

Even though the tests used to measure these criteria are not totally adequate, and should not be considered sufficient estimates in and of themselves, the criteria of cognitive and social competencies are critical components in measuring the degree of disability. It would be more accurate to use these psychometric measures along with other independent measures attempting to tap the same concepts.

Denny (1966) and Bijou (1966) have detailed procedures they used in conducting a behavioral analysis of clients with mental deficiencies and learning disabilities. These procedures help pinpoint specific areas of observable and measureable deficiencies which can then be useful in determining target behaviors. Behavioral approaches, coupled with psychometric approaches are likely to produce a more adequate estimate of the clients' deficiencies.

Blount (1968) reviewed the literature dealing with problem and conceptual processes in mentally deficient individuals. His review can be helpful in identifying additional methods of estimating cognitive abilities.

It is important to keep in mind that a relationship (interaction) exists between the cognitive and social skills. For example, if someone is very low in cognitive skills but relatively normal in social competencies, or vice-versa, the lower score is likely to be a gross over-estimate of this individual's degree of disability.

Examples of Behavioral Therapy for the Severely Retarded:

The classification of severe retardation, generally applies to individuals with I.Q.'s in the thirties and below. There is a variety of data indicating that these minimally functioning individuals are conditionable. Rice and McDaniel (1966), Rice, et al. (1967), Friedlander et al. (1967), Salzberg (1973)[2] and others have presented very impressive evidence demonstrating that conditioning procedures improved the day to day functioning of the severely retarded. An interesting study by Whitney and Barnard (1966) reports data on a fifteen year old girl whose developmental ability was estimated to be that of a seven month old baby; by the Gesell Developmental Scale. Using conditioning techniques they were able to train her to spoon feed herself, hold a cup, etc. Additional evidence for the effectiveness of conditioning techniques can be found in the area of toilet training of the severely retarded. Ellis (1963), Giles and Wolf (1966), Miron (1966), Kimbrell et al.

[2]Personal communication with Dr. Salzberg who was at the time Director of the Intramural Behavior Management Program at the Illinois State Pediatrics Institute.

(1967) and Azrin and Fox (1973)[3] have all clearly documented the tremendous success of operant techniques.

Examples of Behavioral Therapy for the Borderline Educable:

People who fall into this classification generally have I.Q. scores around 60. Greene (1966) presents a very impressive review of the effects of programmed instruction for the educably retarded individual. The programmed instructional procedures which have been found to be effective, have incorporated basic behavioral principles. Before the instruction could begin, the individual had to be taught to attend to the task and certain behavioral problems had to be eliminated. This was accomplished by using a variety of behavior modification techniques. Generally, verbal reinforcements were found to be ineffective with these individuals. Punishment was somewhat necessary, and time-out was used frequently. However, positive reinforcement was preferred.

A classic example of such a program was developed by Hewett et al. (1967). They developed an individualized reading program for the neurologically impaired individual. This program incorporated an errorless training sequence using teaching machines. Each sequence carefully began with baseline material that the individual could accomplish and gradually increased in difficulty. The basic procedures that were generally employed are discussed in detail in The Technology of Teaching (Skinner, 1968). The errorless training procedures are based on the earlier works of Terrace (1963). Moore and Goldiamond (1964) also used this procedure in teaching discrimination patterns to children.

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[3]This was a paper presented at the American Psychology Association convention, 1973, Montreal, Canada.

More recently, computer assisted instruction has been used in training the educably retarded. This was found to be especially effective in the areas that require a great deal of drill and practice. For example, Colby (1973) used computers with autistic children and was able to improve their linguistic ability in 13 of 17 cases. Three excellent general references detailing procedures for rising computer assisted instruction are in Atkinson and Wilson (1959) Computer Assisted Instruction, Hicks and Hunka (1972), The Teacher and The Computer, and Atkinson and Fletchner (1972).

Examples of Behavior Therapy for The Educable and Employable:

A thirty year longitudinal study by Baller et al. (1967) presented data indicating that specific employment training of high grade mental defectives (I.Q. 65-80) could produce an individual capable of self support and job performance which met union-labor specifications.

Neuhaus (1967), O'Connor and Tizard (1956), and Tizard (1965), present strong arguments for the need of hospital workshops to train these handicapped. However, they point out that it is extremely important that hospital training centers train the individual for jobs in which they are potentially employable. This requires adequate equipment, and appropriate contacts with potential employers, along with good public relations. During training it is important that the environment be as similar as possible to the actual job environment. It is also critical that trained instructors and supervisors be empathetic and supportive.

These procedures are also applicable to high school settings where potentially employable students can partake in supervised vocational education programs. There is evidence that a large proportion of these individuals can become useful and productive members of society, if they receive proper training.

Evaluation of Operant Techniques for Treating Learning Disabilities:

A variety of studies have indicated that different techniques tend to be more useful with certain behaviors and individuals. For example, verbal praise does not seem to be a good general reinforcer for individuals with severe learning disabilities. Lovaas et al. (1965, 1966) have demonstrated that severe punishment is very effective in eliminating self destructive behavior in psychotic children. Harvey (1973) also used severe punishment with severely handicapped children. However, when possible, other techniques are preferred. Lovaas et al. research indicates that teaching a patient to respond to other stimuli, such as music, will decrease the likelihood and magnitude of the self destructive behavior, which in another study, he suggests may have been initially triggered by previous punishment.

Other studies have indicated that not attending to inappropriate behaviors will reduce the occurrance of such behaviors. This tends to be true when the population one is dealing with is relatively normal. However, this technique is not as effective when dealing with individuals who have severe learning disabilities.

Lovaas (1973) conducted a follow-up study on children he had treated. He discovered that the children who were returned to an institution had regressed to their former psychotic behavior,

while children who were returned to homes with parents who had been trained in operant techniques actually showed gradual improvement.

Fixed ratio reinforcement schedules were found to be highly effective by Hington and Coulter (1967), in teaching autistic children relatively complex discrimination tasks. Hewett (1968) found that using a new reinforcer for every word taught was helpful. Hewett also developed a teaching booth which helped control the behavior of psychotic children, by blocking out external stimuli, confining the child and producing an environment which provided for optimum attention to the relevant stimuli. In essence this booth potentially cut off most stimulation so that when a stimulus was presented the child was more likely to be attentive.

Hewett (1965) and Lovaas et al. (1967) have demonstrated that language taught by using operant techniques such as imitation, fading prompting, continuous and partial reinforcement schedules, can produce results which the child can then generalize to new situations. However, the ability to generalize has to be taught. Craighead et al. (1973) also used operant conditioning procedures to teach a four year old autistic child to generalize across people and novel situations.

Hingten and Trost (1966) and Jensen and Womack (1967) demonstrate that psychotic and autistic children could be taught to interact and communicate with each other by using operant shaping techniques. Ferinden and Cooper (1973) also successfully used operant techniques to teach writing and language skills to autistic children. These studies demonstrate procedures that can be generalized to classroom situations, when dealing with children who

have learning disabilities. While they are useful, it must be remembered that throughout the literature, the results have consistently indicated that a child who is returned to his original setting will revert to baseline behavior, unless the people who have control over the contingencies are trained in the operant procedures that were used to effect change. A good review article by Gottwald and Wiltaub (1972) discusses and evaluates the use of operant techniques at home and in the school by parents and teachers.

A Discussion of Motivational Techniques

It is generally accepted that achieving changes in behavior requires motivation. Behaviorists use reinforcers and punishment as a means of motivation. A reinforcer is any stimulus that, when presented contingent on a particular response, will increase the likelihood of that response occurring again in a similar situation. The effectiveness of a reinforcer depends on:

1. its ability to be applied immediately following a desired response
2. it being reasonably available and inexpensive
3. its ability to maintain its motivational value (resists satiation)

The most desirable reinforcers are generalized reinforcers. These are reinforcers that have acquired their ability to reinforce by being paired with a variety of other reinforcers (primary and secondary). Since they are reinforcers that are not directly dependent upon a particular depreviation state, they have two

major advantages:

1. they are more likely to maintain their reinforcing properties for longer periods of time,
2. they can be used with a variety of individuals, simultaneously.

Some of the most common generalized reinforcers are: verbal praise, a smile, money, tokens, etc. While these may not always be generalized reinforcers for all people in all situations, they are among the most common.

Ayllon and Azrin (1965) found that psychotic patients were characterized by the apparent absence of effective reinforcers. The procedure they used to identify reinforcers for this population is generalizable to the natural and school environments. They simply started off by observing their psychiatric patients during their free time to see what they chose to do. They then used these behaviors as potential reinforcers for establishing the target behaviors. A teacher who is aware of this procedure can use it most effectively within the classroom.

Another useful procedure is based on work by David Premack. The Premack Principle also begins with careful observation of the individual's preferences, in any situation where the individual has a large number of activities available to him. Whenever students in a classroom setting are given free time, it is relatively easy to identify potential reinforcers based on the students' choice preferences. The particular activity chosen by a child can be labeled a reinforcer for him.

Premack's Principle states that "given any two behaviors of different strengths, the stronger can be used to reinforce the

weaker". For example, if a child prefers playing checkers to studying spelling words, then allowing him to play checkers can be used to reinforce the child's studying of spelling words.

Using a modification of this procedure, these potential reinforcers can be developed into a more sophisticated reward system, a token economy, which more closely simulates the real world. In this system, each reinforcer is assigned a value. The value will differ depending on the desirability of the reinforcer. The student is given the tokens contingent upon his performance of specified behaviors. Like the reinforcers, the various behaviors may earn differing amounts of tokens. The student then takes his accumulated tokens and purchases the reinforcer or privilege he wants. One of the most authoritative sources on establishing a token economy is a book by Ayllon and Azrin (1968) entitled A Token Economy.

A very brief description of setting up a token economy, the advantages, problems to be avoided, etc. can be found in Bushell's book entitled Classroom Behavior (1973).

One of the greatest natural reinforcers for an individual is success. This is especially true with someone who has very little success. Children with learning disabilities have often found school both frustrating and punishing. An aware teacher can structure a learning situation so that a child will meet with a great deal of success. While extrinsic reinforcers may be necessary to begin to get the child to perform, once he is successful, the success itself will gradually become a sufficient reinforcer and the external reinforcers may be phased out. A good example is

when learning to read, the pleasure and information obtained from reading becomes a powerful reinforcer.

The second basic means of motivating a behavioral change is through punishment. Punishment is generally defined in one of two ways. It is the presentation of aversive stimulation contingent upon a response; or it is the withdrawal of a positive reinforcer contingent on a response. Perhaps the most misunderstood, but most commonly used method of controlling behavior in our society is punishment. In addition to decreasing the desired response it may also produce a classically conditioned emotional response. For example, the punishment can be an unconditioned stimulus that may become associated with a teacher or therapist and this may then become generalized to other adults or people in authority. It may also effect operant behavior, other than the one in which the teacher or therapist is specifically interested. Its effects on the specified operant behavior are also not straight forward since there are a number of factors that can determine the effectiveness of the punishment procedures. These factors include the strength of the aversive stimulus, how punishment is delivered (the schedule of punishment), etc.

In the classical Azrin studies, it became evident that if punishment was mild, the suppression of a response recovered quite quickly, and in many cases, it exceeded the original baseline. However, when punishment was severe, there was very little recovery of the suppressed response. This basic research was done on pigeons; however, there is other evidence indicating that it is transferable to humans.

Punishment tends to be most effective in suppressing an undesired response, when it is coupled with positive reinforcement of the desired responses. For example, if a hungry child grabs at food when it is made available, and is punished for the grabbing, he will continue to grab after the punishment is removed, unless he is trained to obtain his food in a more desirable manner. Even mild forms of punishment have been found highly effective when the subject has alternate responses he can employ to obtain his reinforcer.

Another concern in using punishment is that it tends to produce aggression (Azrin, Hutchinson and McLaughlin, 1965), and anxiety. It also tends to be a reinforcer for the punisher. This is one reason the use of punishment is so wide spread. The more one punishes, the more one is likely to punish, and there is a tendency on the part of the punisher to become increasingly severe in his choice of punishment due to adaptation.

The other type of punishment, the withdrawal of a reinforcer, contingent upon a particular behavior, does not seem to have as many undesirable effects a does averse stimuli. This procedure was pioneered by Baer (1962) to effectively eliminate thumb sucking in children, Ayllon (1963) to eliminate stealing of food in schizophrenics, Barrett (1962) who used interruption of music to eliminate nervous tics, and by Weiner (1965) who used a cost effect procedure with normal adults in a laboratory study.

One major and very effective type of punishment, using the withdrawal of positive reinforcers, is the time-out procedure. This term was originated and defined by Ferster and Skinner in 1957. It simply involves removing the subject from the situation for a

specified period of time. He may be removed to another room, a time-out booth, or the like. Time-out tends to be very effective and practical for classroom situations.

A major advantage to punishment is that it can stop dangerous and undesirable behavior very quickly. However, because of the many unwanted side effects, it is generally not a desired procedure, if other procedures are available. The withdrawal of a positive reinforcement has less side effects; however, it is not as effective in eliminating undesirable responses, especially if the subject is highly motivated to emit those responses. It seems that punishment is very effective when alternate responses are also introduced.

An Example of A Successful Behavior Modification Teaching Program

The following example is of a research project (1972-73) conducted and sponsored by the El Paso County Association for Children With Learning Disabilities (EPCACLD) in Colorado. The project directors were Dr. Sarah Rule and Dr. Charles Salzberg. This project incorporates many of the concepts suggested in this paper and provides a good summary and a useful model.

The basic goal of this project was to motivate children who had been identified by their teachers as being non-motivated, and to help each child develop academic, perceptual, and motor skills, based upon his individual entering behaviors.

The selected instructional material had to meet five criteria:

1. it had to be individualized so the students would work at their own rate

2. there had to be some method for estimating entering behavior

3. material had to be well sequenced and each step within the capabilities of the student

4. material had to require frequent observable responding

5. there had to be formal check points in the program so that the students' progress in mastering the concepts could be checked.

The major technique used for motivating students was teacher attention. The teacher, who continually moved around the room, only attended to the students when they were on task. If a student was out of his seat, he was ignored until he returned to his seat and began working. Then the teacher went to him as quickly as possible and made a positive comment such as good work. If the student was disruptive and disturbing other students, the teacher led him to an office out of view of the rest of the class where he remained for two minutes. If he did not remain quiet and seated, in the time-out room, the timer was set for an additional five minutes. This procedure was only used a total of ten times during the six weeks and occurred most often during the first week.

For additional motivation, metal washers were used as tokens. The students accumulated these tokens by working on tasks. They could use them to purchase desired activities during the last ten minutes of each period and could accumulate them for field trips. If a student did not work during the period he did not have tokens to purchase an activity, and therefore, had to sit out the ten minute play period. Almost no student missed more than one activity period because of not working.

For the students who had the "I can't do it" syndrome, simple shaping techniques were used. The student was given a very small portion of the assignment and told to raise his hand when he completed the task so the teacher could check him. He was then assigned another mini-assignment. These mini-assignments were gradually lengthened until they encompassed the entire assignment.

In addition, the children were allowed to keep their own records of progress. This combined with the other motivational techniques and shaping procedures, resulted in the students being on task 80 percent of the time and in considerable academic, perceptual and motor skill gains. This was even true for students who had been classified as seriously disturbed. Rule and Salzberg also found that children who started out needing a great deal of extrinsic reinforcement and a controlled environment began to work more diligently due to their recognition of their own progress in developing their skills. This new feeling of accomplishment and pride carried over to social interactions with other children.

As reported earlier, one of the problems with many behavioral therapy programs, is that there is generally a remission to baseline behavior when the individual is returned to his natural environment (Lovaas, 1973). This program initiated a parent training procedure in which the parents were trained in behavioral management techniques. They were given an opportunity to practice these techniques in supervised tutoring situations and they were taught to collect baseline data and identify target behaviors. These parents also had seminars in which they discussed their particular problems and potential

problems with each other. The parents found this type of training highly gratifying, useful and rewarding.

Methodological Considerations

This section will be divided into two parts, design considerations and statistical considerations. Some of the major criticisms levied against operant conditioners have dealt with problems in research designs. Much of this criticism is due to the use of the single subject designs and descriptive rather than inferential data reporting procedures.

One important advantage of the behavioral model is that it is based on strong investigator control of the subject and conditions. This control would have to be given up if one was to deal with more than one subject at a time (N>1). Obviously, there are advantages to both single subject and group designs. For example, in a single-subject design, the particular effect of the stimulus and its functional relationship to a behavior for a particular organism can be carefully investigated. However, this cannot be generalized to other organisms. When dealing with group designs, one gets the average effect between a stimulus and its functional relationship to a behavior. One cannot see the individual effect and it is generally inappropriate to predict to a particular individual. However, if the subjects were randomly selected the results can be generalized to the population from which the subjects were drawn.

If one is interested in "causal" relationship both single subject and group designs must have internal validity. To the extent that a study has internal validity, one can be assured

that the independent variable caused the effect on the dependent variable. (Stanley and Campbell, 1963)

Operant conditioning methodological procedures have strongly relied on baseline data to estimate the effect of their independent variable. This basic paradigm has used reversal and double reversal to baseline procedures. For simplification of presentation we will use an ABA (Baseline-Treatment-Baseline) design. For example, let's take the data in Figure 1.

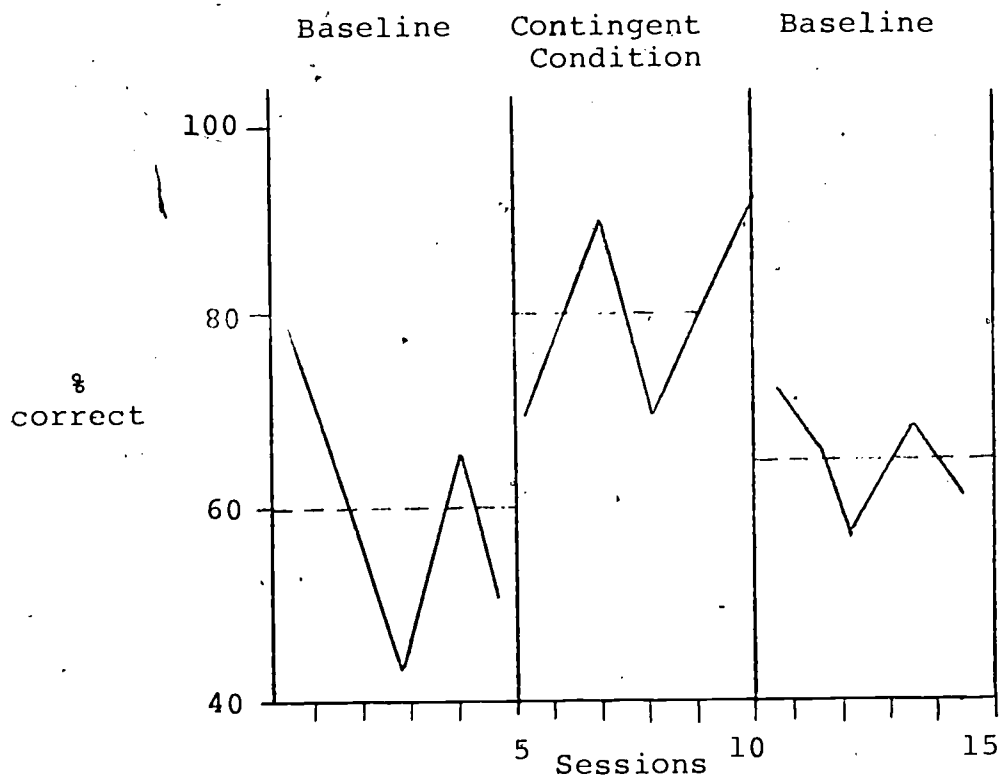

Figure 1

This design assumes that one gets stable baseline data, that the treatment should be significantly different from baseline, and when it is withdrawn, the behavior should return to baseline (not significantly different from baseline but significantly different from the treatment). Conceptually this design is internally valid and it has practically no external validity. However, from a practical point of view, there are problems with the design's internal validity. Subjective estimations, using eyeball techniques are used to determine if the data is significantly different from baseline and if it has returned to baseline. These subjective decisions effect the internal validity.

An even more important limitation of this design is that is is inappropriate for evaluating many topics. For example, if one is taking data on teaching reading, the reading itself becomes the reinforcers, so the experimenter is unable to evaluate the effect of his independent variable (reinforcer). Since it is unlikely that the subject will return to baseline, it is inappropriate to use this design. Therefore, the tendency is to use one of two other designs, either the pretest-posttest design or a modified time series design (multiple observations over time). In the first case, the experimenter gives a pretest-treatment-posttest, and then checks to see if there is a significant difference between the pre and post tests. This design has almost no internal validity. The second design has somewhat more internal validity. Its major limitations according to Stanley and Campbell (1963) are history effects and possibly instrumentation. This design may be conceptually thought of as an AB design. Again, the external validity of this design is extremely weak.

Because the single subject design has come under so much criticism, some operant conditioners have attempted to take the results of several single subject experiments and lump them together trying to produce an artificial group design. This procedure has met with failure because of the lack of control over subject, time, situation and experimenter variability, etc. All this uncontrolled variability tends to wash out large effect differences.

The other procedure that has been attempted more recently is to actually run group designs. In this case, the operant conditioners tend to lose some of their control for the sake of generalizability into natural settings such as classrooms, hospitals, homes, etc. However, they continue to use the same type of descriptive data reporting of these results instead of the more appropriate and powerful statistical procedures.

When the operant conditioner is interested in analyzing his data, either group or single subject designs, he is often interested in questions dealing with: functional trends, such as Wolpe's (1963) work; determining if there are significant differences between the A and B treatments, and the A and A' treatments on an ABA design; and determining if there are significant functional relation differences (shape of curve) between the ABA' treatments of the ABA design.

There is a particular statistical procedure that is very appropriate for dealing with these types of questions. It is the generalized analysis of variance using multiple regression procedures to partial variance (multiple linear regression analysis).

A somewhat detailed discussion of this procedure, as it relates to behavior modification research designs, can be found in Kelly, Newman, McNeil (1973) and Fanning and Newman (1974).

Obviously, both single organism and group designs have a place in research. Both can produce more useful information with the aid of appropriate statistical procedures. Logically, this additional information should help the researchers and practitioners improve their techniques and better determine which procedures are most effective and with what type of person.

Summary

While much is being done with learning disabilities, it seems apparent that the behavioral model has produced some very dramatic results. It has taken individuals who were considered beyond help, and has demonstrated that with the proper techniques, behavioral changes could be achieved. Much of positive effects of the behavioral model can be summed up in its underlying philosophy which is: if the treatment (the experiment) failed to help the patient, then the fault lies in that particular experimental technique, and not with the patient. Therefore, one looks for another technique that will help the patient.

Since these procedures have been successful for the severely disabled, they have obvious potential for the less disabled. Schools, hospitals, training centers, etc. can establish programs which incorporate basic behavioral techniques such as shaping, fading, "time-out", etc. Programs can be geared to creating an atmosphere of success for the disabled. This will produce a reinforcing environment which will both maintain and potentially enhance further growth.

A teaching program using behavior modification was presented as an example of a successful model. In this program, children who had been diagnosed as having learning disabilities made substantial gains as a result of an effective program. It also summarizes many of the procedures and techniques that have been reported as being successful in the literature.

There are a number of design and statistical problems with the behavior modification model. The basic ABA design generally has internal validity; however, it is frequently modified to a less internally valid design. There are also problems with the weak external validity.

A suggested statistical procedure which can improve the interpretation of single-subject design is multiple linear regression. This allows for more objective interpretation of the results than the traditional eyeball and descriptive procedures.

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