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Improving Functional Assessment with Computer-Based Data Collection and Analysis Software

Rebecca May
Eastern Illinois University

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Improving Functional Assessment with Computer-Based Data Collection and Analysis Software

BY

Rebecca May

THESIS

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Running head: COMPUTERIZED BEHAVIORAL OBSERVATION

Improving functional assessment with computer-based data collection and analysis software

Rebecca May

Eastern Illinois University

Abstract

Many students exhibit behavior problems in the classroom that can negatively affect academic performance and social/emotional functioning if not identified and appropriately accommodated (Sugai, Lewis-Palmer, and Hagan, 1998; Scott, DeSimone, Fowler, and Webb, 2000). In order to combat the increasing number of students with behavior problems, an efficient means of assessing and treating problem behavior is warranted (Nelson and Johnson, 1996). Traditional observation methods are limited in the number of behaviors recordable and elaborateness of data analysis (Sharpe and Koperwas, 2001), and do not lend themselves to direct treatment development (Nelson, Roberts, Bullis, Albers, and Ohland, n.d.). Computer-based data collection programs were developed to allow for the recording of multiple behaviors and immediate elaborative, extensive analysis of observational data (Sharpe and Koperwas, 2001), and lead to greater treatment efficacy and increased capability to treat problem behavior. The purpose of the current study is to replicate and extend functional assessment research by using computer software to determine the extent to which the program helps facilitate the collection of observation data, the extent to which the program aids in the development of hypotheses with regard to behavioral function, and the extent to which the program is used to develop and evaluated behavioral interventions.

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Improving functional assessment with computer-based data collection and analysis software

An increasing number of children in the United States exhibit externalizing behaviors, commonly described as antisocial, challenging, defiant, noncompliant, aggressive, and acting out (Nelson & Roberts, 2000; Nelson, 1996). According to the United States Department of Education Office of Special Education Programs (1999), accommodating such students in the classroom is one of the most problematic situations facing teachers and administrators today. In addition, disruptive behaviors negatively impact the school environment, affecting students and staff, as well as the academic, emotional, and social health of the individual. Research regarding post high school trends of students labeled 'seriously emotionally disturbed' supports the highest unemployment rates, poorest work history, and highest number of social adjustment problems of any disability category (Nelson and Roberts, 2000). This bleak outlook supports a need for improved methods of identifying and treating behavior problems in school (Nelson and Roberts, 1996; Nelson and Johnson 2000).

The United States Department of Education Office of Special Education Programs (1999) reported 470,111 students aged 6 through 21 received services under the Seriously Emotionally disturbed (SED) category of the Individuals with Disabilities Education Act (IDEA) in 1999-2000. This number represents 8.3% of the total number of students served under Part B of IDEA in 1999-2000. The number of students aged 6 through 21 served under the ED category of IDEA increased by 20.3 percent in the nine-year period from 1990-91 to 1999-2000. The growth rate of students served under the ED category exceeded the growth rate of the resident population and school enrollment of children aged 6 through 21, from 1990-91 to 1999-2000. Emotional disturbance represented the fourth most used disability category of IDEA in 1999-2000, behind specific learning disability, speech or language impairments, and mental retardation. The increased rate of children deemed eligible for services under the emotional/behavioral disturbance

category signifies a need for an efficient and effective method of assessing and treating behavior problems.

According to Walker et al. (1996), individually designed interventions which meet the unique needs of the student are needed to treat chronic problem behaviors. However, current methods of behavioral assessment collect large amounts of information and generate intervention plans that are unidimensional and not linked to assessment information (Sugai, Lewis-Palmer, and Hagan, 1998; Iwata et al., 1994). Recent reports suggested that other classroom-based interventions are frequently ineffective because they are arbitrarily chosen and not related to behavioral function (Vollmer & Northup, 1996). Therefore, a need exists to develop assessment means that incorporate the function of behavior into an individualized intervention plan.

Current Methods of Data Collection

When a student demonstrates a behavior problem in the classroom, it is necessary to first collect relevant information. There are many methods commonly used by school personnel to collect information regarding problem behavior exhibited by a student. Some methods include verbal reports, checklists, rating scales, and direct observations (Shapiro and Kratochwill, 1988). The data collected are used to assist education professionals in making decisions with regard to student eligibility and educational placement (Shapiro & Kratochwill, 2000).

Verbal Reports

Information obtained through verbal reports from teachers and parents are helpful because of their familiarity with the child and contact in the natural environment of home and school. Although verbal reports are not quantifiable and may not provide statistically valid assessment information, informants do offer crucial information used to help establish operational definitions and construct recording procedures (Shapiro & Kratchowill, 2000).

According to Skinner (as cited in Shapiro & Kratochwill, 1988), verbally

generated reports of behavior and systematic observational reports operate under different sets of behavioral contingencies. Various reports of behavior will depend upon the overlap of such contingencies. In most cases, the environmental contingencies controlling behavior are not exactly the same and therefore would not be expected to produce equivalent outcomes (Shapiro and Kratochwill, 1988).

Verbal reports of child behavior have not been supported by research as being valid assessments of behavior. Shapiro, Lentz, and Sofman (1985) investigated the agreement between teacher reports and direct observation measures of the same behavior. The authors concluded that the two methods of assessment generated different results and therefore may be measuring two different behaviors. In addition, Patterson (1982) found that there was minimal support for the validity of parent reports about child behavior. Low levels of agreement were found between a mother and father's rating of the same child. Patterson concluded that verbal reports about children's behaviors are influenced by factors other than the occurrences of those behaviors as observed.

When the results from systematic direct observations differ from the results of verbal reports, the source of the disagreement must be identified before making diagnosis and beginning treatment. It is important to consider that there is as much variability in the accuracy of direct observation methods as that found among indirect, verbal sources. Publication manuals should be consulted to obtain validity data on the agreement between the results of the measure and systematic direct observations (Shapiro and Kratochwill, 1988).

Rating Scales and Checklists

A variety of checklists and rating scales have been developed by professionals to use at the discretion of qualified practitioners. These measures provide a standardized inventory of behavioral descriptors in which children are rated. The items are standardized to reduce variability in responses and allows for more direct comparisons among children (Shapiro and Kratochwill, 1988).

The use of behavior checklists and rating scales in school-based assessment has become a common means of obtaining a broad overview of the child's emotional and behavioral functioning, including the identification of salient problems and competencies. Traditional norm-referenced assessments also provide helpful information used to classify and determine eligibility of students for certain services ("An Introduction," n.d.).

Information from parents and teachers is helpful because of their familiarity with the child and contact in the natural environment of home and school. Although it is helpful, the information generated from checklists and rating scales is not perfectly reliable or valid because raters are not expert observers. "Informant reports are certainly crude and fallible indexes of children's behavior, abilities, and competencies, but several instruments designed to capture parents' and teachers' perceptions have acceptable reliability and validity" (Shapiro and Kratochwill, 1988).

Checklists and rating scales are also used to classify children according to the severity and patterning of scores on behavioral dimensions. Most rating scales do not assess behavior according to diagnostic criteria, such as those offered in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) or IDEA. However, most rating scales do touch upon some diagnostically relevant aspects of childhood emotional and behavioral functioning. Even though a diagnosis would not be based on a single assessment measure, informants' reports are crucial to the diagnosis of many child psychiatric disorders (Bentzen, 1993).

Standardized checklists and rating scales can help determine the type and degree to which a child's behavior deviates from that of normal peers, and if the child is in need of alternative educational placement. "They can also quantify the degree of deviance in several areas, which may facilitate the selection and prioritization of treatment goals" (Shapiro and Kratochwill, 1988). Furthermore, the quantitative information gathered from parent and teacher ratings is useful in monitoring and evaluating a behavior

treatment plan. A checklist or rating scale can be administered at various times throughout the treatment phase to monitor changes in the child's behavior and determine if treatment goals are met (Shapiro and Kratochwill, 1988).

Checklists and rating scales have the advantage of being simple and efficient in comparison to other means of assessment, such as psychological testing and direct observation. "Checklists and rating scales provide quantitative indexes of child functioning that are useful for plotting stability and change in behavior over time and in response to interventions (Shapiro and Kratochwill, 1988)."

The use of parent and teacher ratings to assess child behavior depends on many assumptions. These measures assume that raters are aware of what constructs are being measured by each item. It is assumed that all raters have the same understanding of reference points for scaling such ratings. Furthermore, variability exists among raters in the degree to which these assumptions are understood (Bentzen, 1993; Shapiro and Kratochwill, 1988). Their knowledge will be dependent upon how long they have known the child, how much time they have spent with the child and in what setting and situations they have observed the child. The characteristics of the informant influence the rating process. It is evident that raters' perceptions of the target child do include true child behaviors and complex aspects of the informant (Bentzen, 1993; Shapiro and Kratochwill, 1988). Although traditional assessments provide helpful information, the data collected cannot be directly linked to the actual behavior problems in the classroom and provide little useful information in developing a behavior intervention plan (Nelson et al.).

Direct Observation

Although a variety of data collection techniques exist (verbal reports, checklists, and rating scales), direct observation of behavior may be the most common method used to assess student behavior. Direct observation methods are used to collect systematic data to record, assess, monitor, and evaluate child behavior. Observing behaviors

empirically may help professionals refine and validate verbal reports of behavior and determine the nature of the problem (Shapiro & Kratochwill, 2000).

Direct observation methods require the examiner to enter the child's environment and collect data while explicitly witnessing the behavior. Depending upon the type of problem behavior that is occurring in the classroom, an appropriate method of data collection must be chosen. Methods of direct observation include: event recording, time sampling recording, latency recording, and duration recording (Bentzen, 1993; and Shapiro and Kratochwill, 1988).

Event recording results in the number of occurrences the behavior was observed during an entire observation period rather than sampling behavior within observation intervals (Bentzen, 1993; Shapiro & Kratochwill, 2000; Shapiro and Kratochwill, 1988). When utilizing an event recording method, the observer must judge when the behavior starts or stops, as opposed to simply observing if it is occurring. Event recording does not take into account when during the observation period the behaviors occur, and does not require the period to be broken into intervals (Shapiro and Kratochwill, 2000; Shapiro & Kratochwill, 1988). Event recording converts frequency data to rates or percentages of behavior. This conversion allows for the report of more precise data and the comparison of data across observation sessions (Shapiro & Kratochwill, 2000). Due to the continuous nature of event recording, behaviors that occur at high rates or that are continuous in nature may be difficult to record. Behaviors that occur infrequently may be suitable targets for event sampling, if the observer is in the setting often or for long periods of time (Shapiro & Kratochwill, 2000).

Collecting continuous duration data may be difficult; therefore, time-sampling procedures are often used to collect duration estimates. Three time-sampling procedures include partial interval time sampling, whole interval time sampling, and momentary time sampling. Interval recording requires observation sessions to be broken into intervals, or blocks of time. For example, a ten-minute observation could consist of twenty 30-second

intervals, forty 15-second intervals, or sixty 10-second intervals. Behavior is recorded per interval and depending on what time sampling method is employed. Partial interval time sampling records behavior when it occurs at any time during the interval. Whole interval time sampling records behavior when it occurs throughout the entire interval (Bentzen, 1993; Shapiro & Kratochwill, 2000). Momentary time sampling records behaviors only if they are occurring at the moment the interval begins. The results of interval recording are reported as the number of intervals in which the behavior occurred, as opposed to the number of times the target behavior was observed or for how long the behavior occurred. Interval recording is used to assess behavior that occurs at a moderate-high rate (Shapiro & Kratochwill, 2000; Shapiro and Kratochwill, 1988).

Momentary time sampling recording requires behavior to be observed and recorded only at prescribed times, such as the beginning of each interval. Results yielded by a time sampling method include a measure of the number of times the behavior was observed at the sampled times, not the number of times the behavior was observed throughout the observation. This method is beneficial when observing behaviors that reportedly occur frequently and not useful for recording infrequent behaviors.

Momentary time sampling is an efficient means of collecting observational data, in that the observer is not required to observe the child continuously throughout all of the intervals of the observation. Since the target child only needs to be observed at the predetermined time during the interval, the observer has the remaining time for other activities, such as observing other students. Momentary time sampling allows the observer to simultaneously engage in other types of recording, such as coding and narrative description (Shapiro & Kratochwill, 2000; Shapiro and Kratochwill, 1988).

However, the small amount of time spent observing the target behavior represents a disadvantage of the time sampling procedure. (Bentzen, 1993; Shapiro and Kratochwill, 1988). Time sampling relies solely upon coded data and does not capture the details of context, including what the behavior looks like, how it changes over time,

and how it may be related to other behaviors. Time sampling data is represented by the number of times a behavior occurred relative to the number of intervals observed. Data is presented in ratio format and used to estimate the duration of occurred behavior (Shapiro & Kratochwill, 2000).

Latency recording records the precise length of time between a specified environmental event and either the onset or completion of the defined behavior. For example, if the teacher asks Johnny to stand up and then ten seconds later Johnny stands up; the latency recording is ten seconds. In order to adequately use latency recording, the environmental trigger event must be well defined so that the observer is able to determine when the behavior has begun or ended. It is suggested that latency recording is used when elapsed time by itself is the major concern of the teacher or parent, and no other method can be found to measure the problem. Typically, latency recordings are used to gather data on compliant behaviors such as sitting down, starting assignments, or following directions (Shapiro and Kratochwill, 1988).

Duration recording results in a measure of the length of time in which a behavior is observed to occur (Bentzen, 1993). This method requires the observer to identify precisely when the behavior starts and stops, as opposed to event recording, which requires the observer to identify when the behavior either starts or stops. Therefore, duration recordings are primarily used when "elapsed" time is a concern (Shapiro and Kratochwill, 1988).

Traditional paper-and-pencil recording methods, such as those described above provide limited information about the effectiveness of the environment observed. These methods are only capable of measuring very few behaviors, are limited to a single method of analysis, and are cumbersome to implement in educational settings. Furthermore, traditional methods may provide an inaccurate characterization of the environment due to the fragmentation of the context observed (Sharpe and Koperwas, 2001).

Functional Analysis/Functional Assessment

Functional Analysis

In addition to checklists and rating scales, functional analysis of behavior is an investigative procedure used to assess and develop treatments for problem behavior. Functional analysis seeks to identify the operant reinforcement contingencies maintaining problem behavior. According to Iwata et al. (1994) the four functions maintaining behavior include, attention, escape, tangible reinforcement, and self-stimulation. For example, a child may be disruptive because exhibiting disruptive behavior in the past has resulted in increased attention from the teacher. The attention from the teacher is reinforcing, therefore increasing the likelihood that the child will display disruptive behavior again. A student may consistently hit another student when assigned a math worksheet in order to be sent to the principal's office and avoid the assignment (i.e. escape). Also, a student may demonstrate appropriate behavior when walking in the hallway because a new pencil awaits them in the classroom (i.e. tangible). Finally, a student may engage in a behavior because it provides internal stimulation. A student may engage in thumb-sucking behavior for no other reason than it provides physical gratification. Behaviors are repeated because the student has created learned associations between the behavior and a particular reinforcer (attention, escape, tangible, or self-stimulatory). The underlying function of behavior is determined by creating experimental conditions to explicitly test hypothesized functions of behavior. Therefore, the goal of functional analysis is to experimentally identify operant reinforcement contingencies and link the results to effective behavioral interventions (Vollmer & Northup, 1996).

Research in the field of functional analysis has focused predominantly on developmental disabilities in the clinical setting, specifically self-injurious behavior. Iwata et al. (1994) manipulated the natural environment, exposing subjects to four experimental conditions, each testing a different potential reinforcer. The condition that

most greatly influenced rates of self-injurious behavior was deemed the maintaining function of behavior. Using functional analysis, Iwata et al. (1994) identified different reinforcement contingencies for different individuals exhibiting self-injurious behavior. Because all participants exhibited similar topographies (i.e., self-injury), this research suggests that similarities in the topography of a behavior may not signify similarity in the underlying environmental contingencies maintaining the behavior. Subsequent studies supported the use of functional analysis to accurately identify relevant reinforcement contingencies (Vollmer & Northup, 1996).

The identification of maintaining reinforcers allowed for the development of effective treatment and prevented a series of ineffective interventions based on clinical judgment. Traditionally, behavior interventions have been chosen based on the desired direction of behavior change, intrusiveness of the intervention, and previous literature. Interventions from traditional assessment methods are not linked to the maintaining reinforcer, which is the primary purpose of functional analysis. The identification of reinforcement contingencies is necessary because it extends beyond the topography of the behavior and facilitates the development of effective interventions. Interventions based on functional analysis use the maintaining strength of the reinforcer and the behavior to manipulate environmental events and increase the likelihood of appropriate behavior and decrease the likelihood of inappropriate behavior (Vollmer & Northup, 1996).

Limitations of Functional Analysis

There are four limitations involving the use of functional analysis in the classroom environment: (1) the majority of research supporting the use of functional analysis has taken place in the clinical setting involving subjects with developmental delays, (2) the process of functional analysis is time-consuming, (3) the implementation of functional analysis is intrusive in the classroom, and (4) results focus predominantly on consequent variables, as opposed to antecedent variables.

Numerous data-based intervention studies have been conducted on functional

analysis in the field of applied behavior analysis. However, limited research exists regarding the feasibility and effectiveness of functional analysis in the school setting (Mueller, Sterling-Turner, & Scattone, 2001; Nelson et al., n.d.; Scott, et al., 2000). Many of the functional analysis investigations involved students with severe or profound mental retardation and focused on self-injurious behavior (Iwata et al., 1994). The majority of studies was conducted in clinical settings rather than natural environments such as classrooms, and was carried out by individuals trained in applied behavior analysis. Although the practice of functional analysis has not been strongly proven in applied settings, recent studies suggest that functional analysis methods may be relevant in the school setting because many classroom behavior problems serve operant functions (Vollmer & Northup, 1996).

In functional analysis, multiple trials testing various environmental reinforcers are typically required to gather data to determine the reinforcement contingency of the target behavior (Iwata et al., 1994). Due to the amount of time required to conduct the experimental trials of functional analysis, it is not considered feasible in the classroom setting (Vollmer & Northup, 1996). In addition, the experimental trials involved in the research process of functional analysis require flexible manipulation of environmental events. The experimental manipulation of events in the natural environment is intrusive to the learning atmosphere of the classroom. Therefore, the intrusiveness of the functional analysis process on the classroom environment is a disadvantage of its use in the school setting.

Traditionally, functional analysis attempted to treat problem behavior by examining and manipulating consequent variables associated with the behavior. Recently, antecedent-based interventions have emerged as less restrictive procedures for addressing challenging behavior (Kern, Choutka, & Sokol, 2002). Implementing an antecedent-based intervention involves using information from a functional procedure to identify environmental variables that may be present or absent in the environment that

may evoke behavior. The intervention alters these variables so they are not presented in a manner provoking the behavior. Whereas, consequence-based interventions impose a consequence following the occurrence of the problem behavior, antecedent –based interventions focus on reducing the probability of the problem behavior. The implementation of antecedent-based interventions may also decrease the need to use punitive consequence-based procedures (Kern et al., 2002). Antecedent-based interventions may help teachers recognize the impact of their behavior and identify new ways of facilitating appropriate student behavior. The over reliance on manipulating consequent reinforcers in functional analysis may overshadow the advantages of manipulating antecedents in treatment.

Numerous research studies conducting antecedent –based interventions have yielded positive results with a variety of behaviors in the education and clinical setting (Ervin, DuPaul, Kern & Friman, 1998; Kern, Childs, & Dunlap, 1994; Moore, Edwards, Wilczynski, & Olmi, 2001). A review of research on antecedent-based interventions revealed the effectiveness of such procedures across a range of disabilities and with children of typical development in the classroom environment (Kern, et al., 2002; Umbriet, 1997). Authors recommended continued research of antecedent-based interventions with at-risk or nondisabled students, suggesting a reduction in special education referrals may result by adapting the environment before challenging behavior becomes severe (Kern, et al.).

When observing individuals in a natural setting, many actions are occurring in the environment and it is difficult to record all necessary events by hand. Therefore, it is not always easy to identify the environmental events surrounding the behavior by using traditional assessment methods (Nelson, et al.).

Brief Functional Analysis

Functional analysis has been criticized for the amount of time required to complete a traditional analysis and lack of use with regular education populations.

Recent research has supported the practice of brief functional analysis, which allows for fewer and shorter experimental trials than traditional methods (Doggett, Edwards, Moore, Tingstrom, & Wilczynski, 2001).

Doggett et al. (2001) conducted a brief functional analysis with two students exhibiting problem behavior in the general education setting. The functional analysis procedures were conducted by the general education teachers with the assistance of graduate students trained extensively in applied behavior analysis. Results indicated that brief functional analysis procedures were performed by classroom teachers with integrity, rated as acceptable by teachers, and resulted in behavior change. Although results from a brief functional analysis are not as extensive as those generated from an extended analysis, researchers demonstrated that functional analysis can be conducted in a short amount of time and produce useful results with regular education students.

Functional Assessment

As previously mentioned, functional analysis is a specific assessment procedure that involves experimental manipulation of environmental variables to discover functional relationships among a target behavior and events in the environment. A less intensive and intrusive method of behavioral assessment, functional assessment, is a general term commonly used in the education setting to represent a wide range of procedures developed to identify maintaining variables of behavior (Vollmer & Northup, 1996).

Functional assessment, according to Doggett et al. (2001) consists of three phases: the descriptive phase, the interpretive phase, and the verification phase. The descriptive phase involves the direct and indirect collection of information pertaining to the target behavior. Indirect assessment methods include interviews, rating scales, checklists, questionnaires and other methods that do not involve direct contact with the target behavior. Direct assessment methods include systematic direct observations of the target behavior in the natural environment or analog situations. The descriptive phase provides

correlational information about the target behavior and environmental events, but does not confirm causal relationships.

Information collected in the descriptive phase is used in the interpretive phase to develop hypotheses, suggesting environmental variables functionally linked to the target behavior. If the confidence level of the hypothesis is high, the treatment can begin. If further verification of the maintaining reinforcer(s) is needed, the third phase of the functional assessment process is begun. In the verification phase, a functional analysis is conducted to confirm or disconfirm generated hypotheses. By experimentally manipulating the environment, reinforcement contingencies (social disapproval, escape, demand, alone) are tested and ideally, the functional events related to the target behavior are revealed (Doggett et al., 2001).

A literature review by Reid and Nelson (2002) suggested that functional assessment is an effective method to utilize with students exhibiting high-incidence problem behaviors and produces socially valid improvements in behavior. Research by Sugai et al. (2000) supported of the use of functional assessment for students with emotional and behavioral disorders and normal cognitive abilities. Mounting evidence suggests that functional assessment can have positive effects on student behavior and that the process can be performed in typical school environments (Reid & Nelson, 2002).

Scott et al. (2000) conducted three case studies with students with learning disabilities functioning in the regular education classroom. All subjects demonstrated behaviors described as "off-task" and were assessed using written narratives of behavior via an ABC form. Behavior intervention plans for all three subjects included reinforcement schedules and were carried out by student teachers working in the classroom. Results of the study indicated that all subjects met the criterion set at the beginning of the treatment phase. Therefore, functional assessment procedures were successfully implemented in the school setting with students who received special education services. Functional assessments lead to simple, effective classroom

interventions, decreasing the need for further traditional psychoeducational assessment and placement in more restrictive settings (Sugai, et al. 2000)

Assessing functional relationships is crucial to the development of effective interventions. While functional assessment refers to the many procedures used to assess relationships, functional analysis specifically assesses functional relationships by systematically collecting data and visually analyzing observational data. However, the experimental conditions of functional analysis require a large amount of time to conduct and intrude upon the natural occurring events in the environment. Functional assessment does not involve experimental manipulation of environmental events and does not statistically analyze data, thus relying almost solely on clinical judgement.

Behavioral Evaluation Strategy and Taxonomy (BEST)

Direct observation is a common method used to identify the environmental variables maintaining a target behavior (Shapiro and Kratochwill, 1988). In addition to traditional paper and pencil methods, a new and perhaps more efficient method of collecting direct observational data was identified in the use of computer based software systems. Such systems were designed to conduct multiple event recordings to provide complete descriptions of interactive classroom settings, and provide immediate feedback on the analysis of participant interactions in a specific context. These systems have the potential to improve the reliability and accuracy of recording observational data relative to traditional but cumbersome paper and pencil methods, and to improve the efficiency of data calculation and graphing (Donat, 1991, as cited in Kahng & Iwata, 1998).

The BEST (Behavioral Evaluation Strategy and Taxonomy) is a computer-based data collection and analysis system that was "designed around contemporary education research and challenges," including, (a) how multiple behaviors and events that occur multiple times and sometimes in concert can be recorded as they actually occur, (b) which measures and analysis forms should be included for more complete and appropriate data representations, and (c) how this type of data information can be

represented with immediacy when conduction feedback and goal-setting evaluations in school-based setting"(Sharpe & Koperwas, 2001, p. 89). Therefore the appeal of such computer software systems lays in the data collection and analysis capabilities.

A major advantage in the use of software programs in regards to data collection involves the efficiency and feasibility of systematically recording multiple events as they occur in the environment. The BEST tool is capable of storing 36 different behaviors during an observation session (Kahng & Iwata, 1998). Behaviors are coded to a designated key on the keyboard and are easily adapted to suit the specific needs of the user. The BEST tool includes various features in which to organize observation responses (Sharpe & Koperwas, 2001). The system has the capability to record response frequency, duration, intervals (variable duration, time samples, latency, interresponse time and discrete trials (Kahng & Iwata, 1998). The flexibility and user-friendly system presents an efficient data collection method capable of meeting the challenges of data gathering in highly interactive educational settings (Sharpe & Koperwas, 2001).

Another advantage of the BEST tool over traditional observation methods is the enhanced capability and sophistication of data analysis (Sharpe & Koperwas, 2001. The system is capable of analyzing multiple characteristics of particular behavior and event occurrences. BEST calculates "response frequency, duration, latency, interresponse time, percentage of intervals, percentage of trials, and conditional variables," (Kahng & Iwata, 1998, p. 254). Subgroups can be defined to combined various responses and calculate interobserver agreement. BEST permits the calculation of central tendencies, variability, and statistical significance (Kahng & Iwata, 1998). The explicit quantification of the interactive characteristics of participants in an educational setting is one of the tools most important contributions, according to Sharpe and Koperwas (2001).

Direct observation data is basic to obtaining reliable and objective education research and evaluation. Computer software tools provide an appealing mechanism for collecting data in highly interactive settings. Research is warranted to further validate the

use of computer-based data collection and analysis tools in the classroom environment (Sharpe & Koperwas, 2001).

Purposes

The current study includes four purposes. The first purpose of the study was to partially replicate and further extend research on functional assessment in the classroom to include computer software data collection. The second purpose of the study was to determine the role of computer software in the collection of observational data. The third purpose of the study was to determine the effectiveness of the computer program in developing hypotheses with regard to behavioral function. The fourth purpose of the study was to determine the extent to which the BEST software tool can facilitate in the development of functionally derived behavioral interventions.

Research Questions

Research Question 1

To what extent can the BEST computer software facilitate in the collection of observation data by a school psychologist?

Research Question 2

To what extent can the BEST computer software facilitate in the development of hypotheses with regard to behavioral function?

Research Question 3

To what extent can the BEST computer software facilitate in the development and evaluation of behavioral interventions?

Method

Participants

Participants for the current study included three students selected from the examiners school psychology internship site. Participants selected for the study were enrolled in a program for students receiving special education services for emotional disturbance and did not attend a general education classroom. The program included

students in grades one through twelve. Participant selection was based on teacher referral and three criteria. The first criterion required participants to exhibit a single behavior problem. If multiple behaviors were observed, the most severe behavior was used as the target behavior of the study. The classroom teacher determined the severity of behaviors. The second participant criterion required the behavior to be potentially maintained by a single function. When a behavior was potentially maintained by multiple functions, the strongest correlating function was targeted in the study. The third criterion required obtained parental consent (see Appendix C).

Materials

The Behavior Evaluation Strategy and Taxonomy (BEST) is a software-based program used to collect direct observation data. The BEST tool was developed by Sharpe and Koperwas and released for use in 2000. In the current study, the computer-based tool was used to collect and analyze observational data and design and evaluate behavior interventions. A video camera was used to record observation sessions and test for interrater reliability.

Procedure

The initial step of the study involved submitting an informative letter to the principal of the alternative program where participants will be chosen, outlining the purpose and procedure of the study (see Appendix A). Upon consent of the program principal, additional letters were sent to all program teachers explaining the purpose of the study and their possible participation (see Appendix B). After informing school personnel, participant selection begun.

The Pathways program conducted regular consultation team meetings twice a week to discuss each student's progress in the program. When a teacher presented a behavioral concern for a student at a team meeting that warranted an observation, the student became a potential subject. Potential subjects were then chosen according to the three previously mentioned criteria.

The procedural design for this study was based on a 2001 study by Doggett et al. (2001), which examined the utility of brief functional analysis in general education classroom settings.

Descriptive phase. After informed consent is obtained, the teacher will complete a functional behavioral assessment form including information about the student's behavior and associated environmental events (see Appendix D). Information from the form is used to formulate hypotheses of potential antecedent and consequent events associated with problem behavior.

After collecting information from the functional behavioral assessment form, the examiner met with the teacher to clarify the information. During the teacher interview, specific times to observe the student were identified, operational definitions were developed, and specific examples of antecedent and consequent events were obtained. The study focused upon the four functions outlined by Iwata et al. (1994): attention, escape, tangible reinforcement, and self-stimulatory reinforcement.

A 20-minute observation was conducted at a time that coincided with the highest level of target behavior, as per teacher report. The BEST was used to collect observational data. During the observations, the examiner coded multiple student, teacher, and peer behaviors specific to the situation, which were programmed into the BEST system. A 20-minute observation was chosen in order to increase efficiency over traditional functional analysis, which typically conducts 12 10-minute observation sessions to test each reinforcement contingency 3 times. Data was gathered to assess interrater reliability using the BEST system. Due to feasibility issues, data was collected during the four observations of case 3.

Interpretive phase. In the interpretive phase, a hypothesis was formulated based on results from the BEST and the teacher interview. The teacher interview was used to develop an initial hypothesis while the BEST program was used to determine if the observations supported the hypothesis. Observational data were analyzed using graphical

displays of the data to identify potential environmental events maintaining the target behavior. Those variables that appeared to covary most closely were used in generating the hypotheses and intervention. The BEST tool generated the graphs.

Verification Phase. A behavioral intervention was designed for each participant to verify the hypothesis developed from observational data using the BEST tool and teacher interview. The treatment tested the functional relationship of antecedents or consequences with behavior, as identified by the BEST. Treatments were selected based on research findings that suggest the intervention is effective for such behavior problems. The general strategy for intervention involved using an ABAB withdrawal design.

The treatment conditions were implemented by the classroom teacher with necessary cues provided by the examiner. Prior to implementing the intervention, teachers received verbal training in how to conduct each session. The examiner provided feedback after each session, and teacher integrity will be noted. The BEST was used by the examiner to collect observational data during the verification phase of the study. Overall case results were shared with each classroom teacher.

Data Analysis

The third purpose of the study was to determine the effectiveness of the intervention, which was carried out during the verification phase of the study. The effectiveness of the intervention was determined using rate of frequency and calculated as a percentage change (increase or reduction) in behavior for individual participants. The percentage increase or reduction will be calculated by dividing the number of times the target behavior occurred during the post-treatment observation, minus the number of times the target behavior occurred during the pre-treatment observation, divided by the number of times the target behavior occurred during the pre-treatment observation and multiplying by 100 percent.

Case 1 Results and Discussion

At a collaborative consultation meeting, the classroom teacher reported concerns

regarding frequent talk-out behavior of a student in the classroom and requested a behavioral observation and intervention suggestions. According to the functional assessment interview completed by the teacher, the frequency of talk-out behavior was 2-3 times per hour. Each instance reportedly continued until a consequence was issued. Antecedents of the behavior, as reported by the teacher, included unstructured times when the student was required to wait for several minutes, times when the student believed he did not need to listen, and times when anyone said something he did not like. Consequences for talk-out behavior, as reported by the teacher included verbal warning, working independently in the hallway, and time in an isolation room. According to the teacher, the primary function of the student's talk-out behavior was to escape academic tasks.

Based upon this information, an initial baseline observation using the BEST system was conducted. Three behaviors were coded during the observation: teacher reprimand (defined as a negative verbal comment to the student regarding inappropriate behavior), student talk-out (defined as an inappropriate verbal comment by the student without permission from the teacher), and student verbal aggression (defined as inappropriate verbal comment of a threatening/aggressive nature). Two student behaviors (talk-out and verbal aggression) were coded to distinguish verbal comments that were aggressive and non-aggressive. Every instance of each behavior was recorded during a 20-minute observation.

Figure 1 provides frequency data of total number of observed behaviors for case 1. During the initial baseline observation, the classroom teacher engaged in 13 reprimand behaviors. During the initial baseline phase, the student engaged in 60 instances of talk-out behavior and 21 instances of verbal aggression.

Based on reports made by the teacher and observation data, it was hypothesized that the function of both the verbal aggression and the talk-outs was maintained by teacher attention (reprimands).

To intervene, a schedule of non-contingent positive feedback was implemented in an attempt to decrease the rate of student talk-out behavior. The teacher was instructed to provide a positive comment to the student on a two-minute interval schedule when cued by the observer. Verbal praise provided by the teacher, and the three previously recorded behaviors were coded during a 20-minute treatment observation. No other instructional modifications were implemented.

Upon implementing the noncontingent attention intervention, a decrease in the rate of all behaviors was observed. Specifically, the classroom teacher engaged in 10 instances of verbal praise and 2 instances of verbal reprimands. The student engaged in 8 instances of talk-out behavior and 0 instances of verbal aggression.

To determine experimental control and add reliability to the hypothesis testing, a return to baseline was implemented. Upon returning to baseline, teacher praise was withdrawn and the rate of student talk-outs and verbal aggression, and teacher reprimands increased. Specifically, the classroom teacher engaged in 1 instance of verbal praise and 13 instances of verbal reprimands. The student engaged in 23 instances of talk-out behavior and 4 instances of verbal aggression. During the second baseline observation, the rate of teacher reprimands remained consistent compared to the initial baseline observation. The rate of student behaviors was not as high as the rate of student behaviors observed in the initial baseline observation.

Because the hypothesis was supported and the intervention resulted in improved behavior the treatment was reintroduced. The relationship between teacher praise and student talk-out and verbally aggressive comments was strengthened and evident in the fourth observation, in which the intervention of teacher-provided praise was implemented. Specifically, the classroom teacher engaged in 11 instances of non-contingent verbal praise and 5 verbal reprimands. The student engaged in 10 instances of talk-out behavior and 4 instances of verbal aggression. The teacher provided praise at a rate of about one positive comment every two-minutes and subsequently, the rate of student talk-outs and verbally aggressive comments decreased to a rate consistent with the initial treatment observation.

In general, the data gathered for case 1 indicate that the student's behavior changed as a function of teacher providing non-contingent praise. Specifically, as the intervention was implemented, the teacher's rate of verbal praise and the student's rate of talk-outs were inversely related. Moreover, during the treatment observations, as the rate of positive praise by the teacher was increased, the rate of teacher reprimands decreased, even though the teacher was not directed to modify instruction. Like wise, during baseline conditions, the rate of student talk-outs decreased furthering the indication that a strong relationship between teacher reprimands and student talk-outs existed.

As previously mentioned, the teacher reported the behavioral function to be escape from academic tasks; however, the data indicated that few academic demands were made despite the high rate of student talk-outs. Therefore, the classroom teacher was incorrect in her perceived function of behavior.

This case demonstrates the functional utility of computer software in collecting observational data in an applied classroom environment and illustrates relationships among the recorded variables to develop and support a hypothesis regarding behavioral function. However, a limitation is that this case did not allow for teacher behavior to be predicted based on recorded responses. The purpose of case 2 was to determine if the computer program could be used to predict the impact of teacher behavior on student behavior.

Case 2 Results and Discussion

In order to determine the software's capability in predicting the impact of teacher behavior on student behavior, case 2 was formatted to record several teacher behaviors as well as multiple student behaviors. The classroom teacher shared her behavioral concerns for a student during a consultation meeting. It was agreed on by the service team at the meeting that observational data would be helpful in determining the most appropriate intervention. At this time, the teacher completed the Functional Behavior Assessment form and met with the examiner to review the responses. Upon interviewing, the teacher reported several student strengths including high activity level, sense of humor, and high academic potential.

The most significant behavior concern was reported by the teacher to be the high frequency of talk-out behavior. Antecedents of the behavior, as reported by the teacher, included unstructured and transition times throughout the day. Consequences of talk-out behavior as reported by the teacher included verbal reprimands, time-out in the hallway, and card changes, which pertain to the behavior management system in the classroom.

Based on the teacher's experience with the student, she believed attention was serving as the maintaining behavioral function of the student's talk-out behavior.

In attempt to predict teacher behavior based on student responses, 4 teacher behaviors (demand, reprimand, redirection, and praise) and 3 student behaviors (talk-out, out-of-seat, and card change) were recorded for each of the four 20-minute observations. Reprimand and talk-out behaviors were defined in the same manner as presented in case 1. Redirection was defined as a verbal statement by the teacher directing student attention to an academic task. A demand behavior was defined as the introduction of a required academic task to the student by the classroom teacher. A card-change behavior was defined as a consequence of the specific classroom behavior management system resulting from inappropriate student behavior. By collecting data on multiple teacher and student behaviors, the relationship among all of the behaviors are illustrated and evaluated allowing for a more accurate prediction of behavior.

Figure 2 displays the baseline observational data collected in case 2 during a 20 minute observation. The teacher engaged in 1 demand behavior, 6 reprimand behaviors, 16 redirection behaviors, and 1 instance of praise. The student engaged in 25 talk-out behaviors, 4 instances of out-of-seat behavior, and 1 card-change.

According to the observation data, teacher attention, in the form of reprimands and redirections occurred at the greatest rate and more often than academic demands. Student talk-outs occurred at the greatest rate compared to other coded student behaviors. Therefore, it was hypothesized that the teacher behavior with the greatest rate (redirections) and the student behavior with the greatest rate (talk-out) were potentially related. Based on the hypothesized function of behavior, it was predicted that as non-

contingent teacher attention increased, the rate of student talk-outs would decrease and in turn the rate of teacher reprimands would also decrease.

During the first treatment observation, the teacher was prompted at two-minute intervals to provide praise (e.g. 'thank you for participating,' 'I'm glad you have your book open,' 'I like how you are sitting nicely in your seat') that was not contingent on student behavior. The teacher was not instructed to modify her behavior in any other way. Upon implementation of the intervention, teacher behavior in the first treatment phase included 3 observed instances of demand, 3 instances of reprimand, 3 instances of redirection, and 15 instances of verbal praise. The student engaged in 5 talk-out behaviors, 1 instances of out-of-seat behavior, and 0 card-change behaviors. As hypothesized, the increased rate of non-contingent praise by the teacher resulted in a decreased rate of student talk-outs and a decreased rate of teacher redirections and reprimands. In addition, the rate of student out-of-seat behavior and card changes also decreased.

In order to evaluate the intervention a third observation that consisted of a return to baseline was conducted. During this intervention withdrawal phase, the teacher engaged in 2 academic demands, 6 instances of reprimanding, 7 instances of redirection, and 0 instances of verbal praise. The student engaged in 11 talk-out behaviors, 6 out-of-seat behaviors, and 1 card change behavior. As predicted, based on the hypothesized function of attention, the decreased rate of non-contingent positive attention resulted in the rate of student talk-outs increasing as well as teacher reprimanding and redirections increasing. Although, a similar relationship between behaviors was observed in the

second baseline as in the initial baseline observation, the levels of inappropriate student behavior during the second observation were not as high.

Because the treatment was effective in reducing student inappropriate behavior and increasing appropriate teacher behavior the intervention was reintroduced. When returning to the treatment phase, it was predicted that the increased rate of non-contingent positive teacher attention would result in a decreased rate of teacher reprimand and redirections, as well as the rate of student behaviors. During the second treatment phase, the teacher engaged in 2 academic demands, 1 reprimand, 7 instances of redirection, and 17 instances of verbal praise. The student engaged in 5 instances of talk-out behavior, 2 instances of out-of-seat behavior, and 0 instances of card-change. Based upon these data, the teacher was correct in her assumption that attention was the maintaining behavioral function.

In general, the data gathered in case 2 indicate that the rate of multiple teacher behaviors and their relationship with student behaviors is predictable using the BEST system. An appropriate and successful intervention was developed based on the predictability of the teacher's behavior and its influence on student behavior. The ABAB single-case design implied a relationship between teacher attention and student talk-out behavior. The data illustrated a high rate of negative teacher attention (i.e. reprimands) associated with a high level of student talk-outs. When the student received positive attention from the teacher that was not contingent upon his behavior, the rate of talk-outs decreased. However, the rate of teacher reprimands also decreased with the high rate of positive attention given by the teacher. This decreased rate of negative attention could also be attributed to the student's decreased rate of talk-outs. Case 3 was conducted to

provide a replication of case 2 which provided evidence of the ability of the BEST system to predict teacher behavior and facilitate in the development of an appropriate intervention.

Case 3 Results and Discussion

Case 3 was established to further demonstrate the ability of the BEST system to record, predict, and illustrate relationships among multiple behaviors, and develop appropriate interventions. At a collaborative consultation meeting, the teacher expressed concerns regarding the student's high frequency of talk-out behavior when working independently on academic tasks. The team suggested collecting behavioral data to assess the classroom environment. The functional behavior assessment interview completed by the classroom teacher described the target behavior as excessive and repetitive requests for assistance with academic tasks. The sole reported antecedent of the target behavior was independent academic work time. Reported consequences of the target behavior included verbal redirection and sit-outs. A sit-out was defined by the teacher as a brief time-out in which the student is prompted to stop what they are doing and to sit down to think about their behavior. According to the classroom teacher, the student's talk-out behavior was maintained by work avoidance or escape. With this information, an initial baseline observation was conducted. Several teacher behaviors (demand, redirection, praise) and student behaviors (talk-out, sit-out) were recorded. All behaviors (with the exception of sit-outs, which are defined above) were defined in the same manner as presented in case 2.

Figure 3 displays frequency data of rate of total number of observed teacher and student behaviors in case 3. During the initial baseline phase, the teacher engaged in 5

academic demands, 1 reprimand, 8 instances of redirection, and 2 instances of verbal praise. The student engaged in 17 talk-out behaviors, 3 out-of-seat behaviors, and 1 sit-out instance. Based on these data, the teacher redirections were hypothesized to influence the rate of student talk-outs, as opposed to demands for academic tasks. According to this hypothesis, teacher attention was the maintaining function of behavior. Based on the data and the working hypothesis, non-contingent positive attention provided by the teacher was a likely intervention. However, in this situation, the classroom teacher did not feel that during independent work, it was important for the student to work independently without interruptions from the staff. The teacher suggested planned ignoring as an intervention to decrease the rate of student talk-out behaviors during independent seatwork. Therefore, during the treatment phases of case 3, the classroom staff were instructed not to respond to the student's questions during independent seat work after directions were given and the student was explicitly asked if there were any questions about the assignment.

Upon implementing the intervention, the teacher engaged in lower rates of all behaviors related to responding to the student. Observed teacher behaviors in the first treatment phase included 1 instance of academic demand and 0 instances of reprimands, redirections, and praise. The student engaged in 6 instances of talk-out behavior and 2 sit-out instances. Data from the initial treatment phase suggest the withholding of attention was associated with a lower rate of student talk-outs. However, one instance of talk-out behavior by the student during the observation, the teacher implemented an unexpected sit-out, which is a consequence based on the behavior management system in the classroom. The sit-out occupied six minutes of the 20 minute observation, in which

the student was expected to remain seated on the floor with no interaction with staff or peers until addressed by the teacher.

The sit-out episode was another factor that impacted student behavior. Therefore, it is difficult to determine whether the planned ignoring or sit-out consequence was attributed to the decreased rate of talk-out behaviors. During the sit-out the student was deprived of all attention from classroom staff and peers and based upon the rate of talk-out behavior, this may have acted as an effective intervention. Therefore, the data does provide evidence of attention as the maintaining function of the student's talk-out behavior, whether it is withheld by planned ignoring or a sit-out consequence.

To validate the hypothesis, planned ignoring was withdrawn during a second baseline observation. Results indicated the teacher engaged in 1 academic demand, 2 instances of redirection, and 1 instance of verbal praise. The student engaged in 12 talk-out behaviors and 0 instances of out-of-seat and sit-out behavior. These data suggest an increase in the rate of student talk-outs, however, the teacher did not engage in an increased rate of redirection. The teacher chose not to respond to the student's talk-outs and therefore was not maintaining the integrity of the study by engaging in treatment (planned ignoring) during a baseline phase. Although, the teacher adhered to a planned ignoring protocol, the teacher did not completely adhere to it, which may account for an increase in student talk-outs.

In a final attempt to validate the effectiveness of planned ignoring on student talk-outs, a second treatment phase was conducted. During the observation, the teacher engaged in 3 academic demands, 0 instances of reprimand, 4 instances of redirection, and 3 instances of verbal praise. Observed student behaviors included 8 instances of talk-out

behavior and 0 instances of out-of-seat and sit-out behavior. This observation did not yield valid results regarding the effectiveness of planned ignoring due to redirections and praise provided by the teacher during the treatment phase.

The four observations of case 3 were video-recorded in order to assess inter-observer reliability. A second qualified observer recorded data using the BEST system. The frequency rate of behaviors was compared among observers. The total interrater agreement over the four observations was 90%. Therefore, the BEST system can reliably be used to collection observational data in the classroom setting.

Overall data from case 3 suggests a direct relationship between the rate of teacher redirection and the rate of student talk-outs. Therefore, the hypothesized function of attention was validated, but poor integrity interfered with the evaluation of the planned ignoring intervention. Although case 3 was plagued by poor treatment integrity and did not identify valid relationships among behaviors, the computer program was able to accurately and successfully record multiple behaviors in the classroom environment. Based on these findings, it is undecided whether the teacher was correct in his assumption that escape was the maintaining behavioral function.

Overall General Discussion

The current study investigated the extent to which computer software could be utilized to aide in developing hypotheses with regard to behavioral function, testing these hypotheses and evaluating behavioral interventions based on such functional hypotheses. This study did this through three investigations. The first investigation recorded multiple behaviors using the computer software in an applied educational environment to illustrate the inter-relationships among behaviors. The second investigation utilized the computer

software to generate and verify a hypothesis based on the observed relationships among multiple recorded behaviors. This investigation allowed for the development and assessment of interventions, as well as the prediction of the rate of behavior for both teacher and student. The third investigation was an attempt to replicate the previous investigations. Although successful recording of the rate of behaviors occurred in the educational environment and an evaluation of an intervention was attempted- poor treatment integrity precluded fully valid interpretation of results.

The study supported earlier research on functional assessment by identifying maintaining variables of behavior (Iwata et al. 1994; Vollmer & Northup, 1996). The study supported the use of functional behavioral assessment with students with emotional and behavioral disorders and normal cognitive abilities who received special education services (Reid & Nelson 2002; Sugai et al. 2000). The current study also supported research by Sugai (2000) who stated that functional assessments lead to simple, effective classroom interventions and decreased need for further traditional psychoeducational assessment. None of the children required evaluation via psychoeducational assessment by the end of their respective school years. The study further supported the importance of assessing functional relationships in order to developing effective interventions. Operant reinforcement contingencies were identified through discussion and verified using systematic observations and linked to effective behavioral interventions. With the exception of case 3, clear functional relationships were established. It can be further argued that despite treatment integrity issues within case 3, functional relationships were established, but demonstrate the importance of treatment integrity when implementing functionally derived interventions in educational settings.

Research on traditional functional analysis described the processes as experimentally manipulating variables in the environment to assess functional relationships. This was done through numerous observations to systematically collect data and visually analyze observational data. The current study operated similarly in that observational data were collected systematically and visually analyzed.

This study extended the research on functional assessment by incorporating a technological means of collecting and analyzing observation data to verify functional hypotheses and develop and assess interventions. The process of functional analysis remained the same in the current study, but in addition the computer software provided four advantages to traditional paper and pencil data collection procedures. First, systematic observations were shorter in length, increasing the efficiency of the processes. Immediate feedback is available using computer software to collect observational data, which increases reliability and decreases the amount of time spent conducting various analyses. Second, the computer software analyses available in the current study included explicit quantification of the interactive behaviors recorded during a session, as well as, frequency and duration counts. Third, compared to traditional paper-and-pencil methods of observation, which record two-three behaviors, the computer software program used in the current study demonstrated the ability to simultaneously measure seven behaviors. Fourth, the computer program creates a more organized method of collecting data, as opposed to accumulating multiple papers when using traditional procedures. In addition, the current study demonstrated inconsistencies in the teachers' ability to determine the behavioral function based on their observations and experiences with the student in the classroom.

Although this study has a number of implications, it is not without limitations. There were no data collected on a composite child to determine the feasibility of recording behaviors of multiple students. Therefore, the study did not collect a comparable rate of behaviors during the same observation session in the same environment. This may have evaluated the influence of teacher behaviors across several students and determine the significance of the target student's behavior compared to peers under the same environmental conditions. Although, data for a composite child were not collected, the software theoretically would allow for this operation.

Integrity issues existed in this study regarding the implementation of the interventions. Across the first and second investigations, the teacher was instructed to provide positive non-contingent reinforcement when cued by the examiner at two-minute intervals. During the treatment phases, the teacher's often did not administer praise precisely on cue and often increased the rate of positive attention to greater than once every two minutes. The increased rate of positive attention may have affected the rate student behaviors to show greater treatment effects than would have occurred at the original rate. However, the teacher's increase in delivering praise could have been due to natural contingencies (i.e. reduced student aberrant behavior).

In the third investigation, the classroom teacher was instructed to ignore all of the student's attempts to obtain teacher attention through talk-outs. During the initial treatment phase, the teacher implemented an alternative consequence (sit-out) when the student talked-out. Therefore, the effectiveness of planned ignoring was undetermined due to the implementation of another consequence for talk-out behavior. However, the data suggest that some variable decreased the aberrant behavior. Moreover, because sit

outs were a behavioral intervention mentioned by the teacher that was not effective one could deduce that either the planned ignoring or a combination of the planned ignoring and the sit-out was an effective behavior change agent.

Future research should continue to examine the reliability of computer software in collecting observational data, generating hypotheses, and evaluating interventions. Research may focus on expanding the functions of computer data collection systems to include use in regular education settings. Continued research is needed to further assess inter-rater reliability when using computer software to collect observational data, as well as collecting comparison data. The target student behavior across all cases in the current study did not vary. Further research is needed to assess the efficiency of computerized observation programs on a variety of student behaviors.

Despite these limitations and the need for future research, this study has demonstrated that computer software can be very beneficial in the development and testing of hypotheses related to behavioral function and in addition evaluation interventions based on such hypotheses. By heeding the call for future research outlined above school psychologists may be better equipped to provide efficient and systematic services with regard to functional behavior assessment/analysis.

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Appendix A

Date

Dear (Principle of Pathways program):

My name is Rebecca May and I am a Specialist Degree Candidate in School Psychology at Eastern Illinois University. I am currently completing an internship at the Pathways Program. To fulfill the thesis requirement for the degree, I am conducting a study to test the usefulness of a computer software program to collect and analyze observational data and develop related behavioral interventions to treat behavior problems in the classroom.

The potential benefits of the software include greater feasibility in the classroom and increased efficiency than traditional paper and pencil methods of observation. The current study will test the effectiveness of behavioral interventions developed using information from the computer software system, and the extent to which the results match verbal reports of behavior from the examiner and the classroom teacher.

I am writing to seek your permission and assistance in completing the study. I would like to include 5 students from the Pathways program in the study. The study involves working with the teacher to obtain information about the behavior problem, conducting several classroom observations, and briefly implementing an intervention with the classroom teacher. The study poses no threats to the students and has enormous potential to increase the feasibility and efficiency of assessing and treating students with behavior problems.

Please feel free to contact me at (office #) if you have any questions or concerns regarding the study. I appreciate your assistance and look forward to working with you.

Sincerely,

Rebecca May
School Psychology Intern

Appendix B

Date

Dear (Teacher):

My name is Rebecca May and I am a Specialist Degree Candidate in School Psychology at Eastern Illinois University. I am completing an internship at the Pathways Program. To fulfill the thesis requirement for the degree, I am conducting a study to investigate the use of computer software programs as a means of collecting and analyzing observational data in the classroom setting and developing effective interventions.

The potential benefits of the software include greater feasibility in the classroom and increased efficiency than traditional paper and pencil methods of observation. The current study will test the effectiveness of behavioral interventions developed using information from the computer software system, and the extent to which the results match verbal reports of behavior from the examiner and the classroom teacher.

I am writing to seek your support and assistance in completing this study. Your involvement would include completing a referral form on a student with a behavior problem, allowing an observation to take place in the classroom, and working with the examiner to implement a behavioral intervention. The study poses no danger to the student and has the potential to discover a more feasible and efficient means of addressing behavior problems in the classroom.

Please feel free to contact me at (office #) if you have any questions or concerns regarding the study. I appreciate your assistance and look forward to working with you.

Sincerely,

Rebecca May
School Psychology Intern

Appendix C

Date

Dear (Parent):

My name is Rebecca May and I am a Specialist Degree Candidate in School Psychology at Eastern Illinois University. I am currently completing an internship at the Pathways Program under the supervision of Barb Moore, Principle. To fulfill the thesis requirement for the degree, I am conducting a study to test the usefulness of a computer software program which collects and analyzes data when observing a student with a behavior concern in the classroom.

The potential benefits of the computer software include greater feasibility in the classroom and increased efficiency than traditional paper and pencil methods of observation. The current study will test the effectiveness of behavioral interventions developed using information from the computer software system, and the extent to which the results match verbal reports of behavior from the examiner and the classroom teacher.

I am writing to seek your permission to include your child in the study. The study requires the classroom teacher to complete a simple form regarding the child's behavior and I will unobtrusively observe the child in the classroom for five 20-minute sessions using the computer software program. The teacher and I will develop an intervention for each participant which will be conducted for three 20-minute sessions. The study poses no danger to any student and does not require any additional activities for your child.

If you have any questions or concerns, please contact me at (office #).

Sincerely,

Rebecca May
School Psychology Intern

I give consent for my child, _____, to participate in this study.

_____
(Parent/Guardian Signature)

Appendix D

FUNCTIONAL ASSESSMENT INTERVIEW

TARGET BEHAVIOR

Describe the behavior_____

_____

Intensity: Mild_____Moderate_____Severe_____

Frequency: ____x per hour ____x per day ____x per week

Duration: Length of each demonstration of behavior: _____

SETTING

Where does the behavior occur? (settings or activities) _____

When does the behavior occur? (times of day, etc.)_____

People Involved? _____

Other variables? _____

ANTECEDENT

What events precede the behavior? What appears to trigger the behavior? (assigned task, peer interaction, transition, environmental variables, internal and/or external factors, etc.)

_____

_____

_____

CONSEQUENCE

Describe what happens immediately after the behavior occurs. (positive or negative attention from peers and/or adults, removed from task, physical response, behavior ignored, etc.)_____

_____

_____

FUNCTION

What appears to be the purpose of the behavior? (to get_____, to avoid_____)

_____

_____

Figure 1

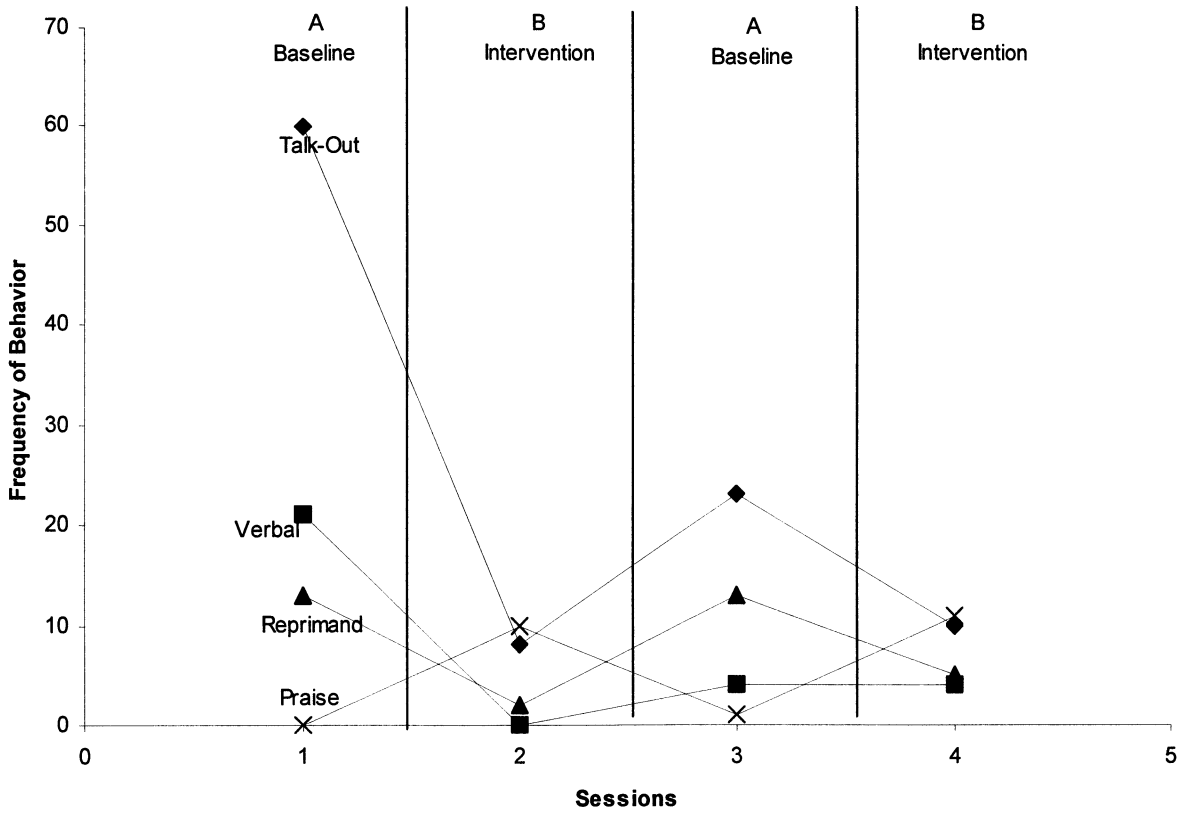

A
Baseline
B
Intervention
A
Baseline
B
Intervention
Talk-Out
Verbal
Reprimand
Praise
Frequency of Behavior
Sessions
0
10
20
30
40
50
60
70
0
1
2
3
4
5

Figure 2

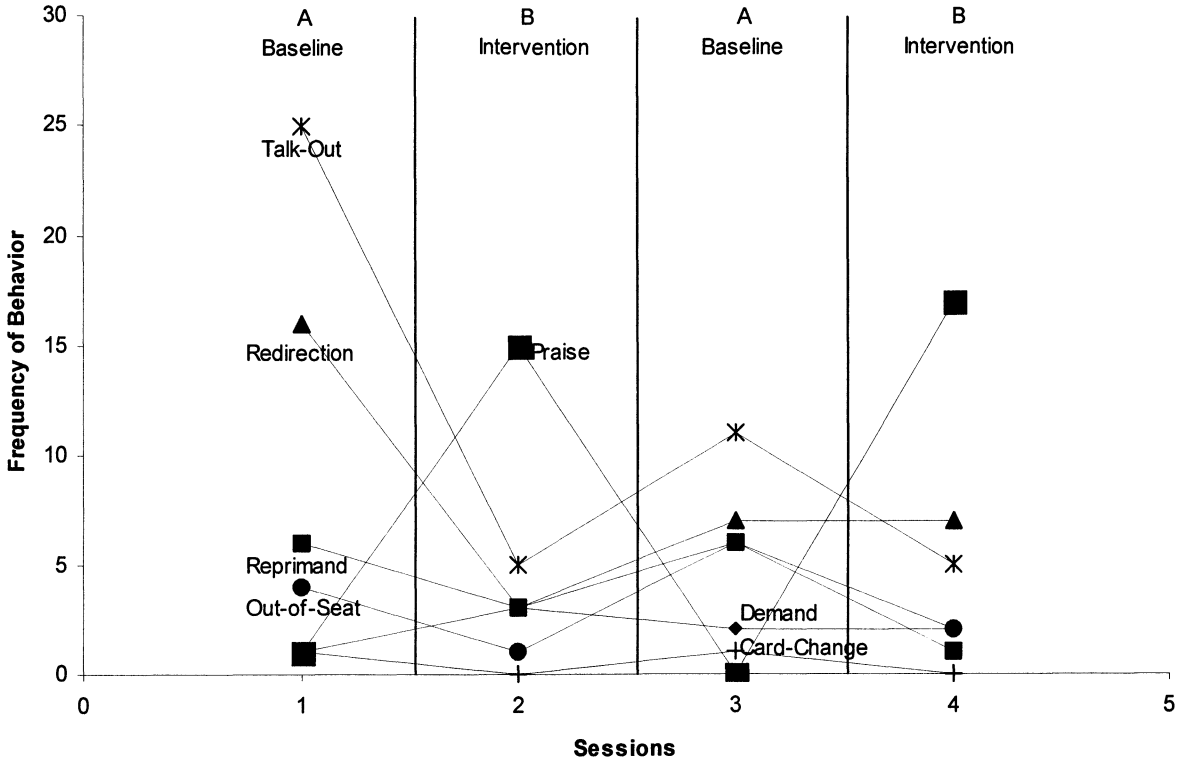
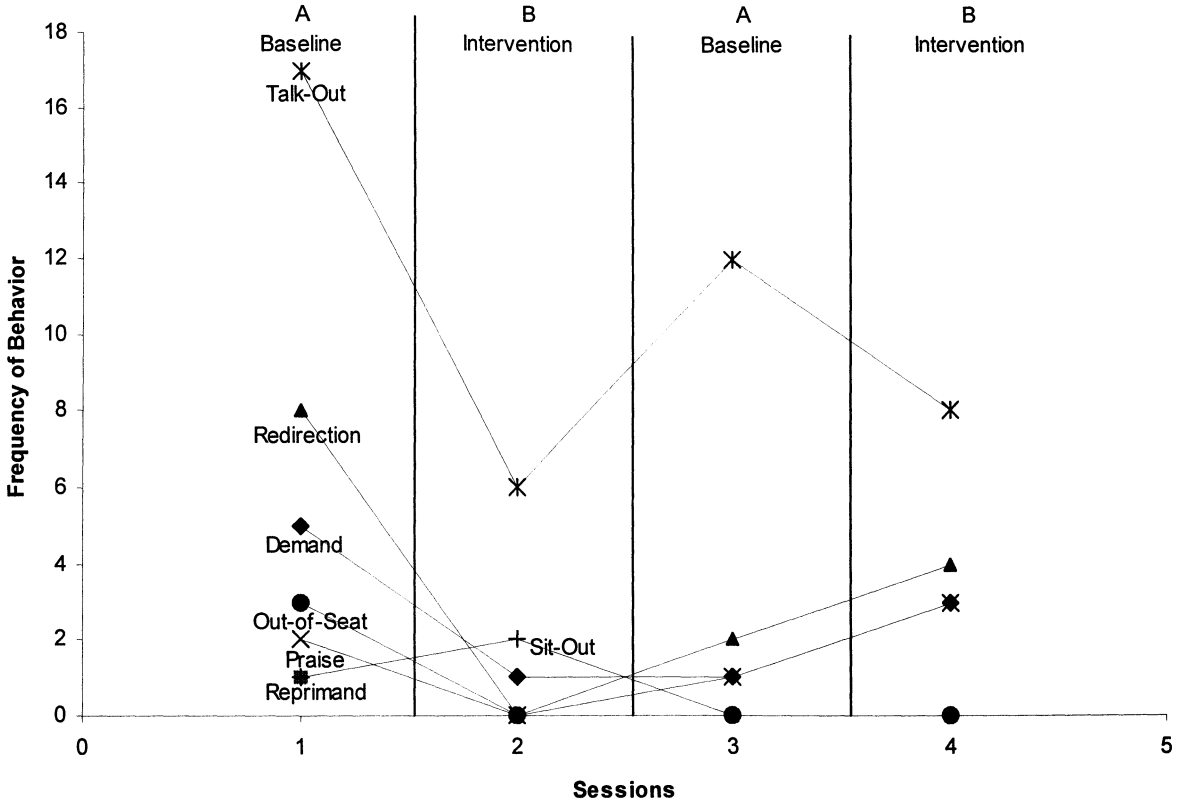

A
Baseline
B
Intervention
A
Baseline
B
Intervention
Talk-Out
Redirection
Praise
Reprimand
Out-of-Seat
Demand
Card-Change
Frequency of Behavior
Sessions
30
25
20
15
10
5
0
0
1
2
3
4
5

Figure 3


A
Baseline
B
Intervention
A
Baseline
B
Intervention
Talk-Out
Redirection
Demand
Out-of-Seat
Praise
Reprimand
Sit-Out
Frequency of Behavior
Sessions
0
2
4
6
8
10
12
14
16
18
0
1
2
3
4
5