

COMPARISON OF BEHAVIOR TRACKING METHODS

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Dedication

To my family, whose encouragement and support throughout my academic journey has allowed me to grow into the person I am today.

To my partner, Chris, who has been a constant source of support for the past five years.

My thanks and appreciation to the faculty, staff, and supervisors that I have had the privilege to work with during my graduate education and training.

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To Dr. Theodore, your work ethic and precision has been a model to me since my Advanced Psychopathology course my first year of graduate school.

Abstract

Individuals with severe developmental disabilities often experience a variety of problematic behavior patterns which result in harm to themselves or others around them. Behavioral intervention, which includes the observation of a problematic behavior and a resultant plan on how to address or prevent that behavior, has been demonstrated to substantially increase the quality of life for these individuals. Most forms of behavioral intervention, due to its empirical underpinnings, require interventionists to track the occurrence of the problematic behavior in order to evaluate the efficacy of the implemented plan. Most often, this involves the use of paper tracking sheets. Little attention has been paid to the way that behaviors have been tracked during the process of behavioral intervention. Paper tracking does not offer accountability and, in real world settings, is often neglected by staff members who work with individuals with severe developmental disabilities. The result is poor data which reduces the efficacy of behavioral intervention plans.

This study involved the creation of a smart phone application which was used to track the occurrence of consultant identified problematic behaviors in adults with developmental disabilities. The application was evaluated in a day program for adults with developmental disabilities. Staff at the program were trained to use the application. In a single subject design, paper and electronic behavior tracking were compared. The results suggest that electronic charting was able to capture more instances of problematic behavior than was captured on paper. However, it is unclear how accurate the charting via paper or electronic means is in this setting. An exploratory survey was administered to assess staff's attitudes towards behavioral interventions and the individuals with whom they work. Data on their personality characteristics

and racial identification was also collected. The survey may have implications for staff hiring. Subsequent studies may further refine the survey questions.

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CHAPTER I

Introduction and Review of the Literature

Individuals with developmental disabilities experience a high rate of problematic behavior. For example, in one sample nearly 61% of adults with an intellectual disability had a behavior disorder (Deb, Thomas, & Bright, 2001, p. 508). Behavior disorders may include aggression, destructiveness, self-injury, temper tantrums, over activity, screaming/shouting, scattering objects, wandering, night-time disturbances, objectionable personal habits, antisocial behavior, problematic sexual behavior, and attention seeking behavior (Deb, Thomas, & Bright, 2001, p. 508). These behavior disorders impact the quality of life of individuals with developmental disabilities and those around them.

As early as the 1960's, behavioral approaches to intervention were developed to address these problematic behaviors (Carr et al., 1999). Today, medication often supplements behavioral interventions, as medications has been shown to reduce certain problematic behaviors (Deb, Sohanpal, Soni, Lentre, & Unwin, 2007). However, medication may also produce undesirable side effects and medication is ineffective at reducing certain problematic behaviors, underscoring the need for behavioral approaches to intervention.

Modern approaches to behavioral intervention for behavior disorders take the form of “positive behavioral support”, with the goal of applying “behavioral principles in the community in order to reduce problem behaviors and build appropriate behaviors that result in durable change and a rich lifestyle” (Carr et al., 1999, p. 3).

Behavioral principles are selected and applied through a process called Applied Behavior Analysis. This approach utilizes Skinnerian principles with the goal of effecting positive behavioral change in an applied setting (Bear, Wolf, & Risley, 1968). While much research has

been completed in laboratory settings, this is of limited utility in an individual's home, workplace, or socialization settings (i.e., applied settings). Thus, the goal of an interventionist is to bridge the gap between what is known about behavior intervention (i.e., that which has been derived from structured empirical study) and the individual's unique home, work, and social settings. This process involves identifying problematic behaviors, selecting problematic behaviors for intervention, and tracking the outcome of interventions.

Common Procedures for Identifying, Targeting, and Charting Behaviors

Hurwitz and Minshawi (2012) discuss procedures for a functional analysis. The goal of a functional analysis is to determine the function of a behavior and the contingencies which perpetuate it. In service of this goal, first, a behavior that is problematic is identified; it is important during this stage to determine if the behavior is of "significant enough concern to merit intervention" (p. 92). A behavior is considered significant if it will impact an individual socially, may harm an individual, restricts the places that an individual can go, or interferes with other activities (pp. 92-93).

The next step, according to Hurwitz and Minshawi (2012), is to develop an operational definition of the problematic behavior. It is important that the operational definition be objective, clear, and complete. Once an operational definition is developed the conditions under which the behavior will be observed and charted must be identified (Hurwitz & Minshawi, 2012). Hurwitz and Minshawi (2012) note that there are several facets of a behavior for which data may be collected; these facets are "frequency count, rate of occurrence, or duration of the behavior" (p. 97). There are several ways of coding these data, including "(1) event coding, (2) interval coding (partial and whole intervals), (3) time sampling, and (4) duration coding" (p. 97). For the purposes of this study, and what is practical in many settings due to limitations in staffing

resources, event recording will be used. In event coding each instance of a behavior is charted in an effort to summarize the number of times a behavior occurs. Commonly used behavior tracking sheets also collect information about the date and time when the behavior occurred. In many settings, this charting occurs on paper. However, more recently electronic charting has become a possibility.

Electronic Charting

Horovitz and Johnny (2012) systematically reviewed the literature on charting types and found a dearth of literature comparing electronic charting to paper charting. Only two notable studies have emerged.

Kahng and Iwata (1998) reviewed 15 software systems for collecting data used in Applied Behavioral Analysis applications. Some systems used desktop computers while others used handheld devices. Notably, Kahng, and Iwata's (1998) review does not examine the efficacy of these programs in assisting with behavior modification. Consumer electronics technology has evolved much since Kahng and Iwata's (1998) review. New devices and interfaces have emerged, leading to more possibilities for electronic data collection. This is especially true given the ubiquity of smartphones.

In their study, Tarbox, Wilke, Findel-Pyles, Bergstrom, and Granpeesheh (2010) compared electronic charting via a handheld computer to traditional paper charting for discrete trial training for children with Autism Spectrum Disorder. In discrete trial training, a task is operationalized and the consumer (e.g., child, dependent adult) may receive some assistance (e.g., verbal prompt) with the task. The result is charted for each trial. A reinforcer is often paired with a successful trial. Tarbox et al. (2010) found that paper charting was faster and the

both methods were of comparable accuracy. Tarbox et al. (2010) failed to find any compelling reason to prefer electronic data charting.

However, these results may be expected given the technology available at the time. Prior to the proliferation of common smartphones, most behavior therapists and like staff were unfamiliar with handheld electronic devices, which were small and cumbersome to use due to their interfaces. Only in 2007 was the first iPhone released; widespread consumer adoption of smartphones did not occur until much later. Many of these early devices utilized styluses and did not have touchscreens that could effectively register presses from a finger. In the years since Tarbox et al.'s (2010) study, these devices and public familiarity with them has improved greatly. It is possible that a similar study today based on more modern devices would yield different results.

Tarbox et al. (2010) employed electronic data collection for discrete trial training. While discrete trial training is an important approach to behavior modification, this approach is not feasible for behavioral intervention in group homes (the residential facilities where many individuals with developmental disabilities reside) and at day programs due to the number of clients present and the frequency with which they engage in problematic behaviors. For some of the most severe maladaptive behaviors, other charting modalities are more ideal. One approach, event coding, may be the simplest variant of behavior charting and thus suited for residential and supported work settings.

In event recording, “target behaviors” are identified and the occurrences of these behaviors are charted. In some variants, intensity, duration, and severity are also charted. Depending on the setting, staff may also be asked to chart the antecedents, behavior, consequences, and environments where the behavior occurs; this however requires substantial

time. Tarbox et al. (2010)'s study does not effectively generalize to these settings or event coding.

Moreover, with modern software, it is possible to define software based “buttons” corresponding to target behaviors. The buttons could be programmed to chart the time that the behavior occurs automatically, providing richer data for analysis than is traditionally collected via paper. As touchscreens have evolved, it is now possible to use fingers to manipulate items on a device screen accurately.

Definition of Terms

Consumer: The Community Mental Health Centers Act of 1963 attempted to reduce the population of individuals in institutional settings (Mechanic & Rochefort, 1990). Shortly after this legislation was passed, California, the setting of the present study, passed the Lanterman Mental Retardation Act of 1969 (May & Hughes, 1987). This act was subsequently revised in 1972 and 1976. In order to qualify under the act a person must have a developmental disability with onset before age 18 that is expected to be permanent. The act provided “alternatives for institutional care” and established how the care is made available, including establishing the bureaucracy that can deliver such care (May & Hughes, 1987, p. 217). May and Hughes (1987) argue that the Lanterman Act represents a departure from previous approaches to developmental disabilities and “restate[s] the ‘problem’ of mental handicap in terms of rights, rather than needs” (p. 291). John (2011) consequently terms the program an “entitlement” (p. V).

May and Hughes (1987) also noted that the act supports “a free market philosophy” that results in purchase of services from vendors for developmentally disabled consumers. “Regional Centers”, essentially “brokers for the State”, were established to assist individuals with purchasing services (p. 220). Employees from Regional Centers conduct Individual Program

Plan (IPP) meetings on a regular basis, which serve to set goals, monitor an individual's progress, and ensure that services are being delivered as agreed. Following these meetings an IPP report is produced.

Notably, the programs and services purchased by the Regional Centers must be evidence based. The relevant law elaborates, "[...] the Legislature intends that expenditures on state programs for persons with developmental disabilities shall have measurable and desirable results. The results shall reflect the degree to which persons with developmental disabilities are empowered to make choices and are leading more independent, productive, and normal lives" (Cal. Welfare and Institutions Code § 4750). Thus, documentation of intervention was required.

In California, the Regional Centers consider individuals with developmental disabilities "consumers" of their services (Disability Rights California, 2012, p. 6).

Developmental Disability: Developmental disability broadly refers to a disability that begins during a developmental period. For current purposes, two will be considered: Autism Spectrum Disorder and Intellectual Disability.

The Diagnostic and Statistical Manual for Mental Disorders 5 defines Intellectual Disability as "a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains" (American Psychiatric Association, 2013, p. 33). Prior to 2010 and before the passage of Rosa's Law by the United States Congress, "intellectual disability" was referred to as "mental retardation". Rosa's Law replaced the term "mental retardation" and its variants with "intellectual disability" (Rosa's Law, 2010). The Diagnostic and Statistical Manual for Mental Disorders IV Text Revision, noted that "mental retardation" is "characterized by significantly sub average intellectual functioning (an IQ of approximately 70 or below) with onset before age

18 years and concurrent deficits or impairments in adaptive functioning” (American Psychiatric Association, 2000, p. 39). The Diagnostic and Statistical Manual for Mental Disorders 5 does not contain IQ criteria for each level of intellectual disability. However, the clinician is encouraged to evaluate the level of adaptive functioning and functional impairment before making a diagnosis.

According to the Diagnostic and Statistical Manual for Mental Disorders 5, Autism Spectrum Disorder is characterized by “persistent deficits in social communication and social interaction across multiple contexts”, and “restricted, repetitive patterns of behavior, interests, or activities” (American Psychiatric Association, 2013, 50). Notably, “symptoms must be present in the early developmental period” and there must be “clinically significant impairment in social, occupational, or other important areas of current functioning” (American Psychiatric Association, 2013, p. 50). “Autistic disorder”, “Asperger’s disorder”, and “pervasive developmental disorder not otherwise specified” in the Diagnostic and Statistical Manual for Mental Disorders IV Text Revision have now been collapsed into one category called “Autism Spectrum Disorder” (American Psychiatric Association, 2013, p. 51).

The Present Study

An iPhone software program for event recording of problematic behaviors was developed and evaluated in a supported work setting, a behavioral management day program for adults with developmental disabilities, in Southern California.

Paper charting and electronic charting were compared. Electronic charting was expected to produce higher charted instances of problematic behavior.

Video recordings of developmentally disabled clients engaging in problematic behavior were rated by individuals blind of the charting condition for the presence of problematic

behavior. These ratings were expected to better correlate with electronically charted data than with data charted on paper.

An experimental survey was developed to assess individuals' perspective on behavior charting, electronic behavior charting, and attitudes towards the behavioral change in adults with developmental disabilities.

CHAPTER II

Methods

Study Design

All staff members at a behavioral management day program were asked to participate in the survey portion of the study. All prospective participants were given informed consent forms to sign. Individuals who agreed to participate were given two surveys, one at the beginning of the study and one at the end of the study. These surveys collected demographic information, work history, and personality information of the participants. They also contained exploratory scales designed to capture staff members' attitudes towards behavior charting and behavior modification.

Staff members who were assigned to work with clients with an active behavior plan and indicated that they wanted to participate in the charting portion of the study were provided with training for the experimental electronic behavior charting system. Note that all staff who work with clients with an active behavior plan were required to chart using the paper charting system due to organization policy at the behavioral management day program.

In an ABAB prospective design, staff who participated in the charting portion of the study were asked to continue to chart using the preexisting paper charting system for one week. Then, staff was asked to chart using the experimental electronic charting system. Then, staff were asked to chart using paper system for one additional week. The electronic charting trials were not conducted simultaneously due to the limited availability of charting devices and in order to control for time effects.

Random half-day samples of recordings of video cameras in the common rooms of the behavioral management day program facility were collected.

Research Participants and Setting

Participants, staff members who work with adults with developmental disabilities, in this study were recruited from a behavioral modification day program located in the greater Los Angeles area.

Participants, staff members at this behavioral management day program, were asked by the study's author to opt into this study following a training on paper charting. Staff was provided with a demonstration of the electronic charting system. They were informed that they may opt out of the study without any penalty.

All participants were asked to complete a survey before the experiment commenced and following the completion of the experiment. Participants were eligible for electronic charting if they currently work with a consumer with an active behavior intervention plan that required paper charting.

Instrumentation

Initial survey. The first sought to obtain information about participants and their attitudes towards behavior modification and behavior charting.

Demographic questionnaire. Demographic information and relevant work experience information was requested from participants.

Attitudes scales. In order to obtain information about staff members' attitudes towards behavior modification and behavior charting an "Attitudes" scale was developed. This scale is composed of several subscales. In the "Ability to Change" subscale, staff were asked about the strengths of their beliefs in behavior modification and the strength of their beliefs that a consumer can change their behavior. In the "Attitudes Towards Behavior Charting" subscale, staff were asked about their opinion of behavior charting and its usefulness. In the "Attitudes

Towards Electronic Behavior Charting” subscale staff were asked about their opinion of electronic behavior charting as an alternative to other types of charting. Staff were asked to rate all items on a Likert scale ranging from 1 to 10 to reflect their level of agreement or disagreement with the statements. Note that the order of all the items in the scale were randomized and presented to staff without the subscale labels; all staff received the same survey. These items were designed to have high face validity.

Racial Ingroup Identification Index. For exploratory analysis, Racial Ingroup Identification Index was included in the survey. The Racial Ingroup Identification Index measures “the degree to which participants identify with their own race” (Kenworthy, Barden, Diamond, & del Carmen, 2011). This scale was developed to assess prejudice in study of a video game with white and black characters. The measure has good reliability (Cronbach’s $\alpha = .94$). The author’s study also demonstrates that the measure has external validity (i.e., is related to the behavior of participants in the study). Permission did not need to be obtained for the measure as this study is for non-commercial research purposes.

The Big Five Mini-Modular Markers. Also for exploratory analysis, Saucier’s (2002) 40-item personality inventory (“Big Five Mini-Modular Markers”) was administered to staff. This measure is a psychometrically valid and reasonably short measure that assesses the “Big Five” factors of personality. The “Big Five” are extroversion, agreeableness, conscientiousness, emotional stability, and openness (Saucier, 2002, p. 26). The inventory contains 40 items and is designed to have “markedly lower interscale correlations, with no loss of validity, relative to previous marker sets with comparable numbers of items” (Saucier, 2002, p. 1). Interscale (i.e., between personality domain) correlations range from -0.03 to 0.19, suggesting that there is not significant overlap between personality domains. These characteristics and research on the

scales external validity suggest that Saucier's (2002) scale has good psychometric properties and that it is suited for this application.

Second survey. The final survey consisted of a readministration of the Attitude Scales items.

Behavior data. Data were collected via paper and electronic charting. Note that prior to this study staff utilized paper Behavior Data Sheets in order to collect data on the maladaptive behaviors of their clients (i.e., those with a developmental disability) and to comply with state requirements. Paper Behavior Data Sheets thus represent treatment as usual. Electronic charting, prior to this study, was not being used at this site. However, electronic charting has increasingly been implemented within the health care industry and also represents an emergent industry standard. In some settings, electronic charting may also be regarded as treatment as usual.

Behavior data sheets. Participants who participated in the charting part of the study were given a list of target behaviors for their client on a Behavior Data Sheet. See figure 1. Operational definitions of the client's target behaviors and known antecedents to these behaviors were listed on the reverse side of the paper (duplexed).

BEHAVIOR DATA SHEET																	Page 1 of 1	
Consumer: <u>Demo</u>		Month & Year: <u>July 2015</u>																
Behaviors		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Property Destruction	AM	o	o	o	o	o	o	o	o		o	o	o	o	o	o		
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
	PM	o	o	o	o		o	o	o	o	o	o	o	o	o	o		
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
Physical Aggression	AM		o	o	o	o	o	o	o	o	o	o	o	o	o		o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
	PM	o	o	o	o	o	o		o	o	o	o	o	o	o	o		
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
Inappropriate Sexual Behavior	AM	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
	PM	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb		
Behaviors		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Property Destruction	AM	o	o	o	o	o	o	o	o	o		o	o	o	o		o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	
	PM	o	o	o		o	o	o	o	o	o	o	o	o	o	o	o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	
Physical Aggression	AM	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	
	PM	o	o	o	o	o	o	o		o	o	o	o	o	o	o	o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	
Inappropriate Sexual Behavior	AM	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	
	PM		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
	Staff	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	Jb	

Figure 1. Sample Paper Charting Form

Electronic behavior charting. Participants who participated in the charting portion of the study were asked to use an iPhone 4 running iOS 7.1 for electronic behavior charting. The custom electronic charting software, BxTrack, was designed and programmed by the study's author in the Swift programming language on Xcode 6.2 running on OS X 10.10. Behavior data was stored on the phone and backed up on a server via secure connection.

BxTrack was designed to be setup by a behavior consultant. The first time the program was run, the client's name was requested. See figure 2. Then, the program requested target behaviors. See figure 3.

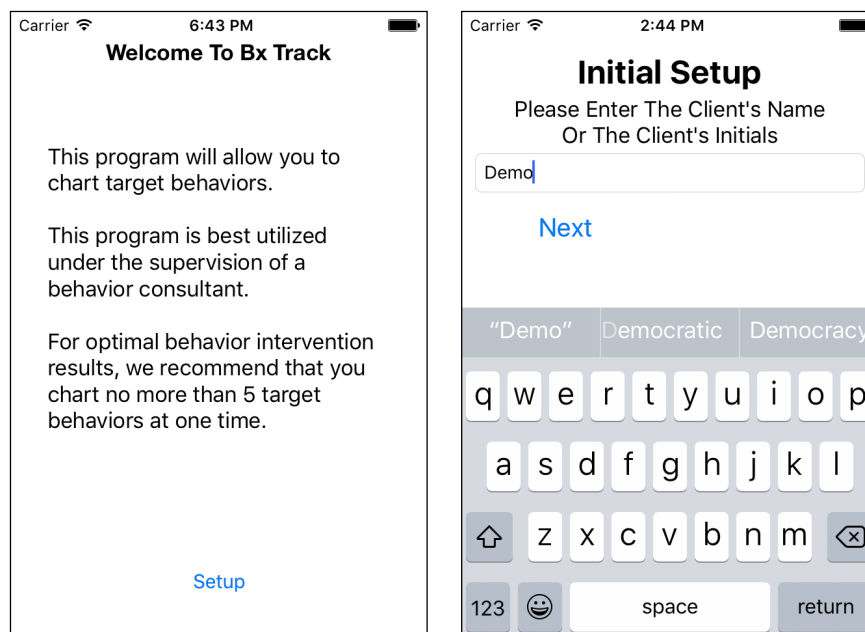


Figure 2. Program setup: Start screen and client name entry

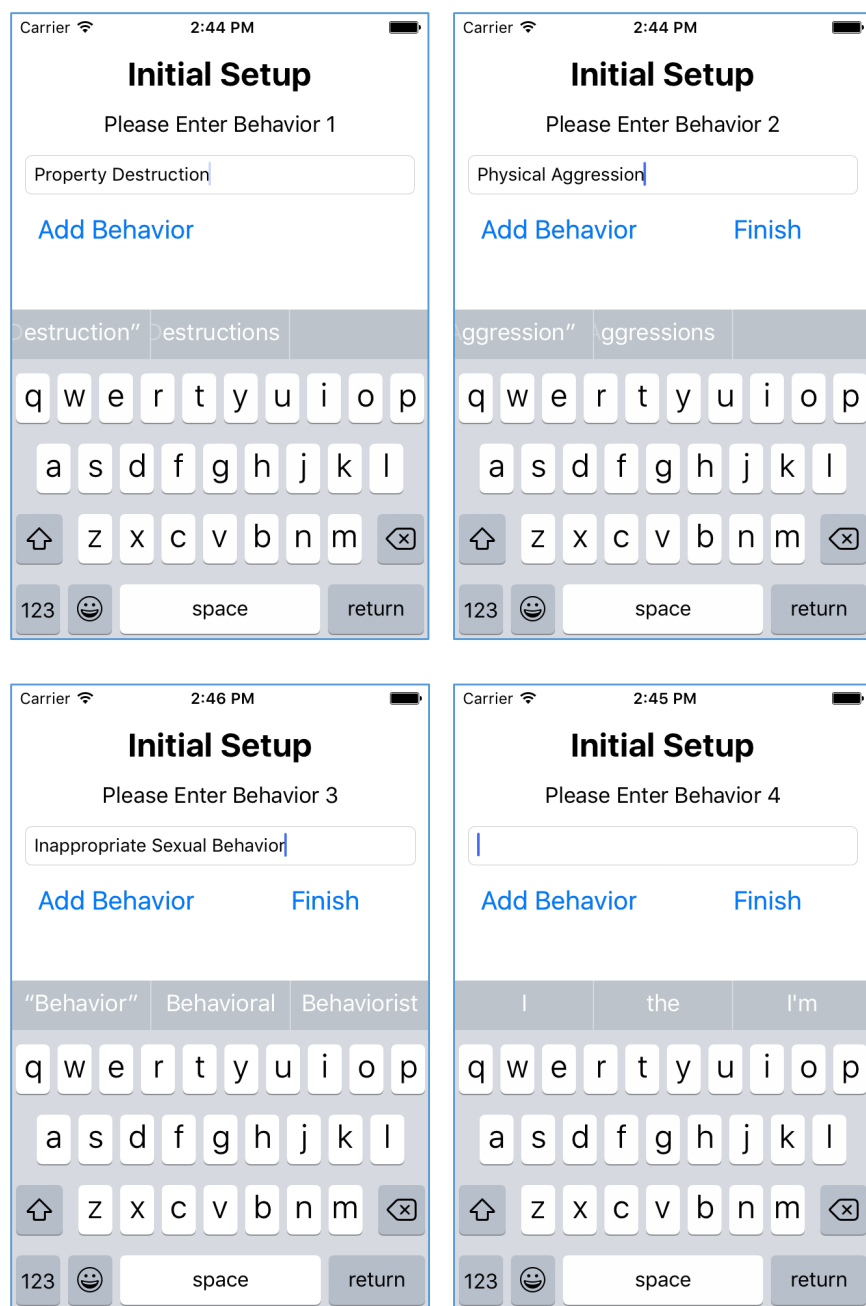


Figure 3. Program setup: Entry of target behaviors

BxTrack required staff to log in before charting. See figure 4. Note that this is an analog of standard practice on paper behavior data sheets; staff initials the documentation. The client's initials and their target behaviors were entered into BxTrack as they appeared on the behavior tracking sheet by the study's author.

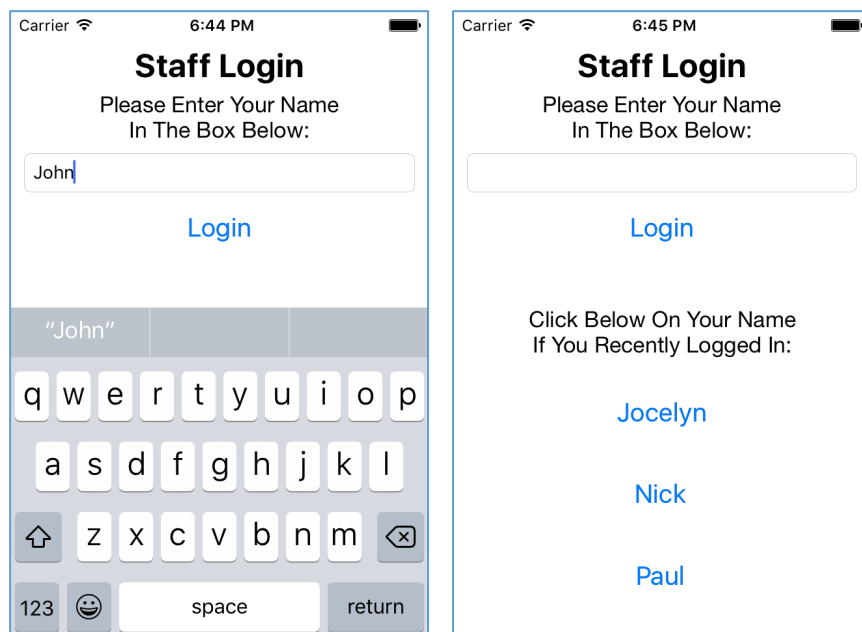


Figure 4. Login screen

Once logged in, staff were prompted via tactile and visual alert to chart a client's behavior 10 minutes from the time they last charted. The screen turned yellow to indicate the need for charting. See figure 5.

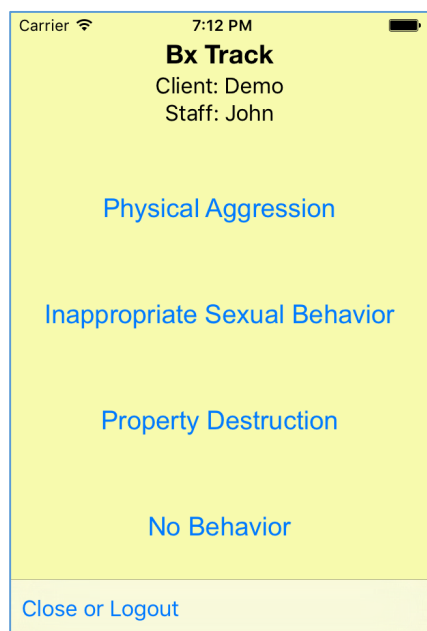


Figure 5. Charting screen after 10 minutes

If staff failed to chart, every minute thereafter they would receive an audible and tactile alert. During this period the screen would turn a light shade of red to indicate that charting was overdue. If no behavior occurred, staff were required to select “No Behavior” to dismiss the alert and to return the screen color to white. See figure 6.

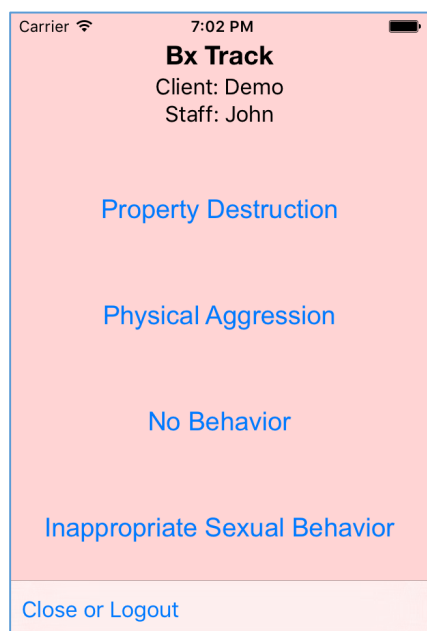


Figure 6. Charting screen after 11 minutes

If an error was made, staff could shake the phone and received a prompt to correct the error. The last behavior charted was listed when staff shook the phone. See figure 7.

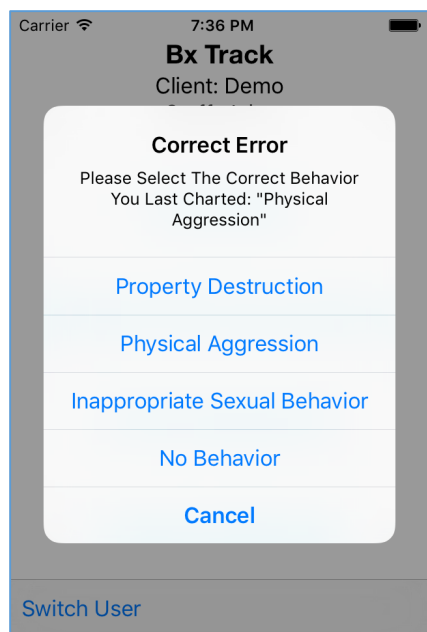


Figure 7. Correction screen

The order of the target behaviors was randomized on the phone in order to increase the cognitive load required for the staff to chart and in an attempt to prevent staff from indicating that no behavior occurred habitually. See figure 8.

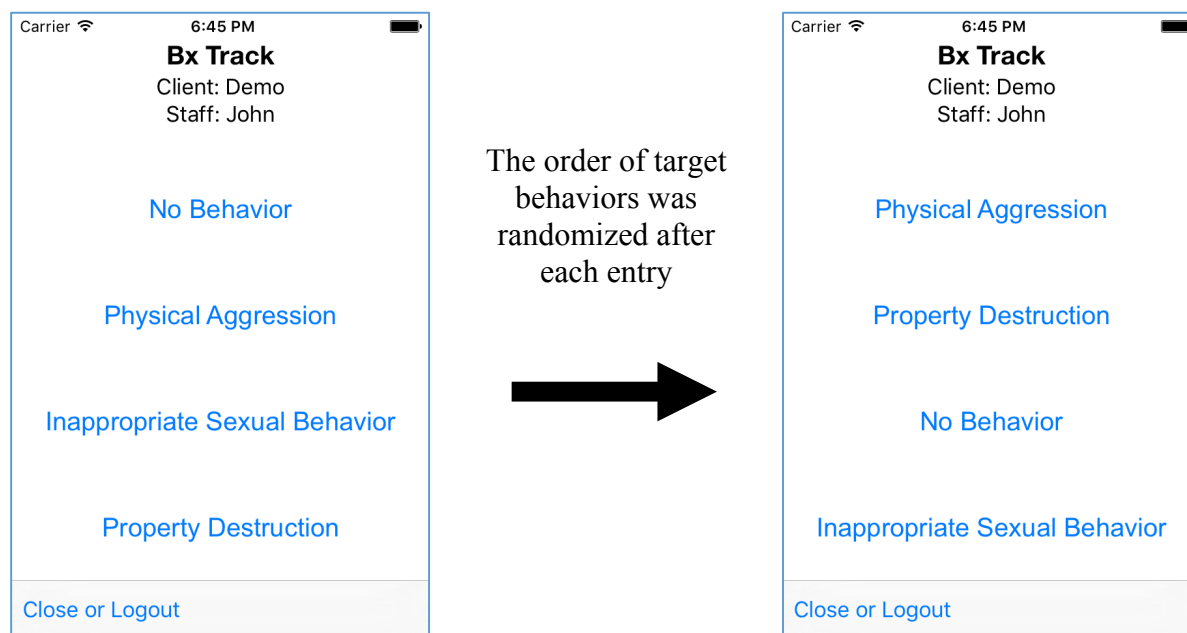


Figure 8. Chart screen with randomization

Video recording. Cameras and a recording system were already installed on site and utilized on a regular basis for training. Video recording was utilized prior to this study to assist with training and to ensure a standard of care and therefore no changes in staff behavior would be expected due to the collection of these videos. The video recordings were regularly audited by management. Staff were aware of their placement within the facility. Cameras were placed in common areas and were not placed in private areas (e.g., bathrooms). Audio was not recorded. These videos were rated by clinical psychology doctoral students in order to assess the accuracy of the collected data.

Video rating. The videos from the security system present in the facility were downloaded in GeoVision .avi format. They were transcoded to MP4 .mov format. The study's author designed a rating program, VideoCoder, in Processing 2.2.1. This program played the

video and displayed buttons corresponding to different target behaviors. The video speed was played six times faster than real time in order to facilitate efficient coding.

Video raters, clinical psychology doctoral students, were provided with approximately half an hour of training and a coding manual. They were provided with an encrypted laptop with the videos loaded into the VideoCoder program. They were then asked to select the behavior that they observed while watching the videos. See figure 9 for an example of the interface.

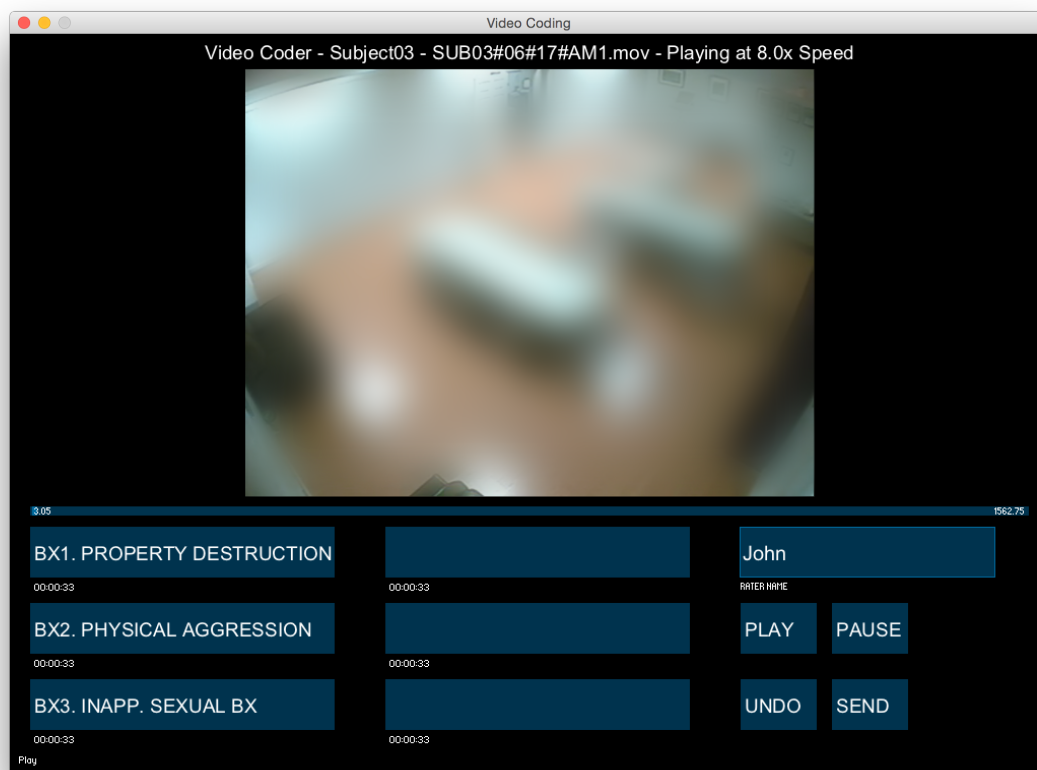


Figure 9. VideoCoder program screenshot

Procedures

Survey. All staff members were given an informed consent form at a monthly staff meeting. All staff members who agreed to participate were asked to sign the informed consent form, place it in a manila envelope, and instructed to take a survey next to the envelope. The

researcher left the room during this period. Using data from the first survey, staff members were invited to take part in the second part of the study, involving the paper data collection and electronic data collection.

Staff were given the second survey by a manager at staff meeting following the completion of behavior data collection phase. Staff who participated in the first survey were instructed to take a survey and place it in a manila envelope after they completed it. Staff were also instructed to place a “+” sign in the top right of the survey if they were part of the charting portion of the experiment.

Behavior data collection. All staff were trained on the use of behavior data sheets at the monthly staff meeting prior the beginning of the experiment in accordance with their regular staff training schedule.

Staff who participated in the charting portion of the study were provided with hands-on training with the charting software prior to the commencement of electronic charting. Then staff were provided with the electronic charting devices by management for the duration of the electronic charting period and instructed to switch charting modalities by management.

Data analysis. IBM SPSS Statistics 22.0 was used for statistical tests.

Comparison of the frequency of electronic charting and paper charting. Data from the paper and electronic portion of the study were compared using a sign test, a non-parametric test that enables comparison of observational data in different conditions (Dixon & Mood, 1946). Since the null hypothesis is that that the two conditions were equivalent, pairs of behavior data (data collected on the same day in different phases of the experiment) are excluded if the frequencies are the same or data was not collected on one day in the pair, coded 0 if the paper charting frequency is greater than electronic charting frequency, and coded 1 if electronic

charting frequency is greater than the paper charting frequency. Then, a binomial test with a test proportion of 0.5 is used to evaluate the difference between the observed proportion of days where electronic charting was greater than paper charting.

Correlation between data collected and ratings of video recordings. Two clinical psychology doctoral students charted the behaviors that occurred in the video recordings via the VideoCoder program. Videos were played at six times normal speed to facilitate efficient coding. They were not told how data were being charted for the clients in the video (i.e., were blind to the data collection condition), however the rating tools (either paper or electronic) were apparent in the video. As multiple data collection trials occurred concurrently, raters would not be expected to know which charting modality was being used with which client.

Video data were charted for two clients, client 1 and client 3. Videos for client 2 were not rated due to the inclusion of verbal behaviors (e.g., threats, emotional outbursts) in his behavior plan. Since audio was not recorded, video raters would not be expected to be able to accurately code these behaviors.

Twelve half-day intervals for client 1 and client 2 were randomly selected for coding, with 6 intervals in the morning (8 am to 12 pm) and 6 intervals in the afternoon (12pm to 4pm). These periods were abbreviated slightly if the client arrived late or left early from the program. If data were not collected at the program, either on paper or electronically, the interval was excluded.

Frequencies obtained for the paper Behavior Data Sheets were correlated with the ratings from the VideoCoder program. Data from the electronic charting program were also correlated with the VideoCoder program.

Debriefing. Staff were debriefed via a handout which summarized the study. This handout was a letter sized printout of the poster presented at the APA 2015 conference. Contact information for the study's author was included.

Characteristics of Clients Observed by Study Participants

Client 1 was a male client in his late 20's with Severe Intellectual Disability. His pica behavior (i.e., putting items in his mouth that are not food), helmet wearing behavior (to prevent injury), and attention seeking behavior (feigning a seizure with an attention contingency) was targeted for intervention.

Client 2 was a male client in his mid 20's with Mild Intellectual Disability and Pervasive Developmental Disorder, Not Otherwise Specified. His targeted behaviors included making suicidal or homicidal threats, physical aggression, emotional outbursts (e.g., yelling, cursing), and stealing.

Client 3 was a male client in his mid 50's with Autism Spectrum Disorder, Obsessive Compulsive Disorder, and Profound Intellectual Disability. His property destruction, physically aggressive behavior, and inappropriate sexual behavior were targeted for intervention.

Descriptive Statistics of Sample

A total of 10 employees completed the first survey. The sample consisted of 3 males (30.0%) and 7 females (70.0%), ranging in age from 22 to 54 years old ($M = 32.30$, $SD = 11.363$). Participants were primarily Black/African American (50.0%), with 30.0% of the sample identifying as Hispanic/Latino, 10% identifying as Asian/Pacific Islander, and 10% identifying as multiracial. The majority of the sample was monolingual and spoke English (70.0%), while 30% of the sample was bilingual, speaking both Spanish and English. Most of

the participants indicated that they were born in the United States (80.0%), 20% of respondents did not answer this question.

In regards to work characteristics, 80% of participants indicated that they had worked as a caregiver before, while 20% indicated that they had not. Most participants indicated that they have worked in similar settings (e.g., residential facilities, group homes, day programs) either currently or in the past, with 30% working in 2 settings, and 40% working in 3 settings. On average, participants had worked with adults with intellectual disabilities for approximately 5 years ($M = 4.8$, $SD = 4.06$) with a range of 9 months to 10 years.

A total of 4 staff members were eligible and selected to participate in the charting portion of the experiment.

CHAPTER III

Results

Comparison of the Frequency of Electronic Charting and Paper Charting

For all three clients the observed proportion of days where electronic charting yielded higher frequencies than paper charting differed significantly from the test proportion of 0.5, one tailed $p < 0.001$. This suggests that staff charted more target behaviors via electronic charting than via paper charting. This hypothesis was supported.

Table 1

Comparison of Charting Types

Client	Category	N	Observed Prop.	Test Prop.	Sig. 1-tailed
1	Electronic > Paper	21	.88	.5	<.001
	Electronic < Paper	3	.13		
2	Electronic > Paper	16	1.00	.5	<.001
	Electronic < Paper	0	.00		
3	Electronic > Paper	21	1.00	.5	<.001
	Electronic < Paper	0	.0		

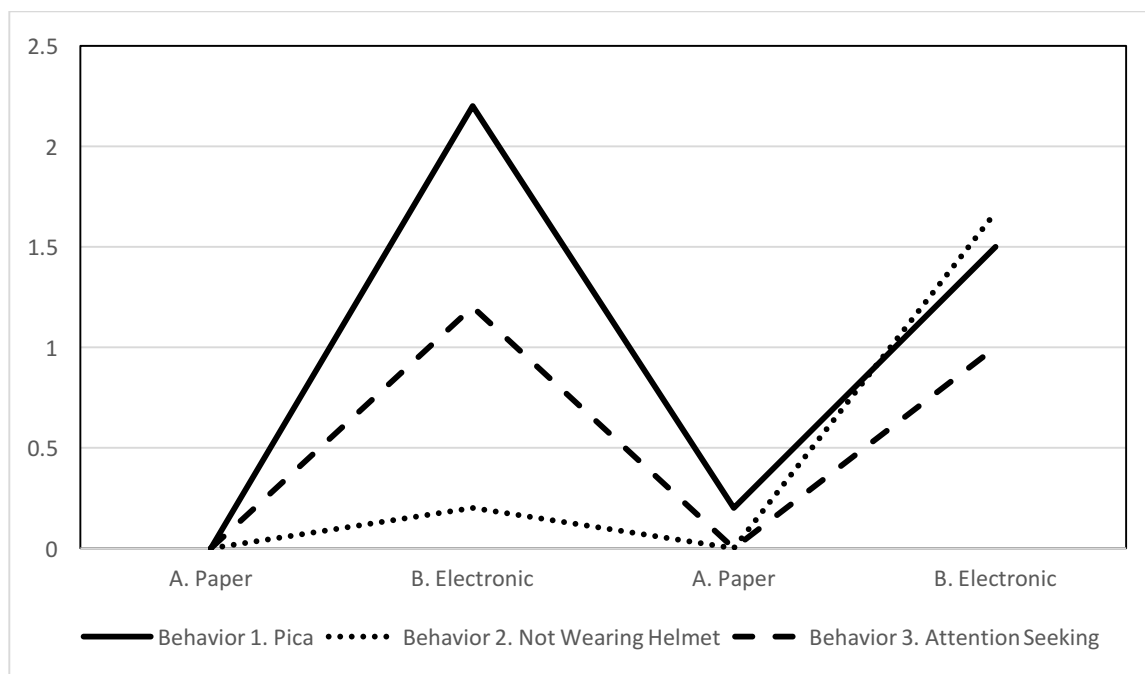


Figure 10. Client 1 comparison of charting

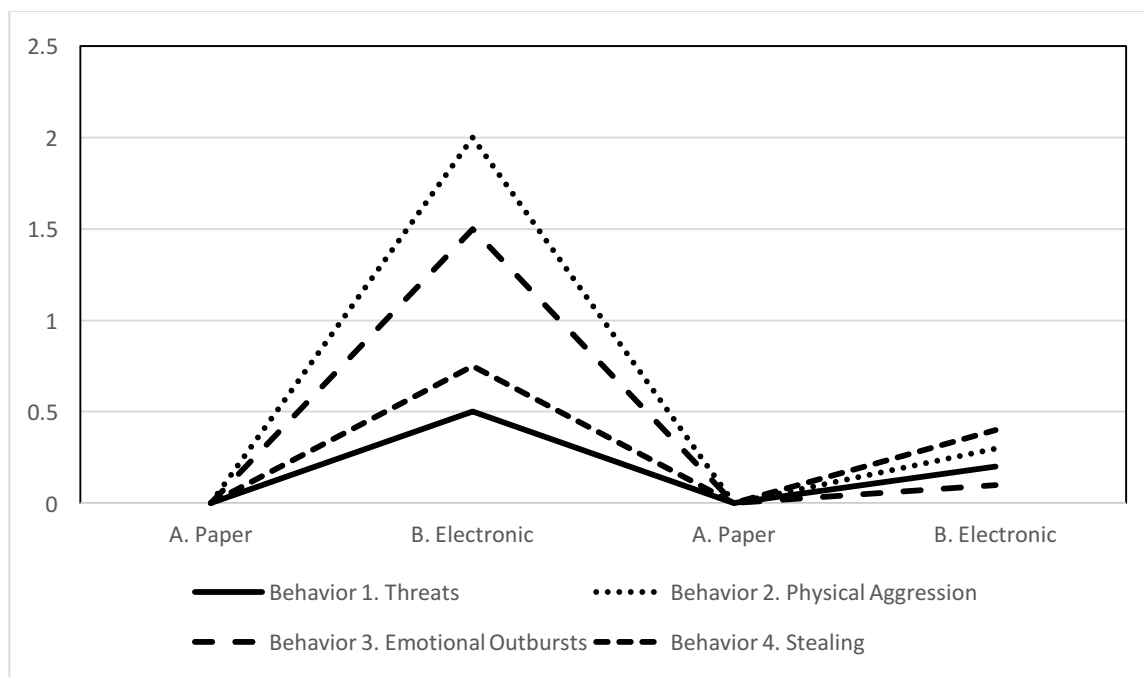


Figure 11. Client 2 comparison of charting

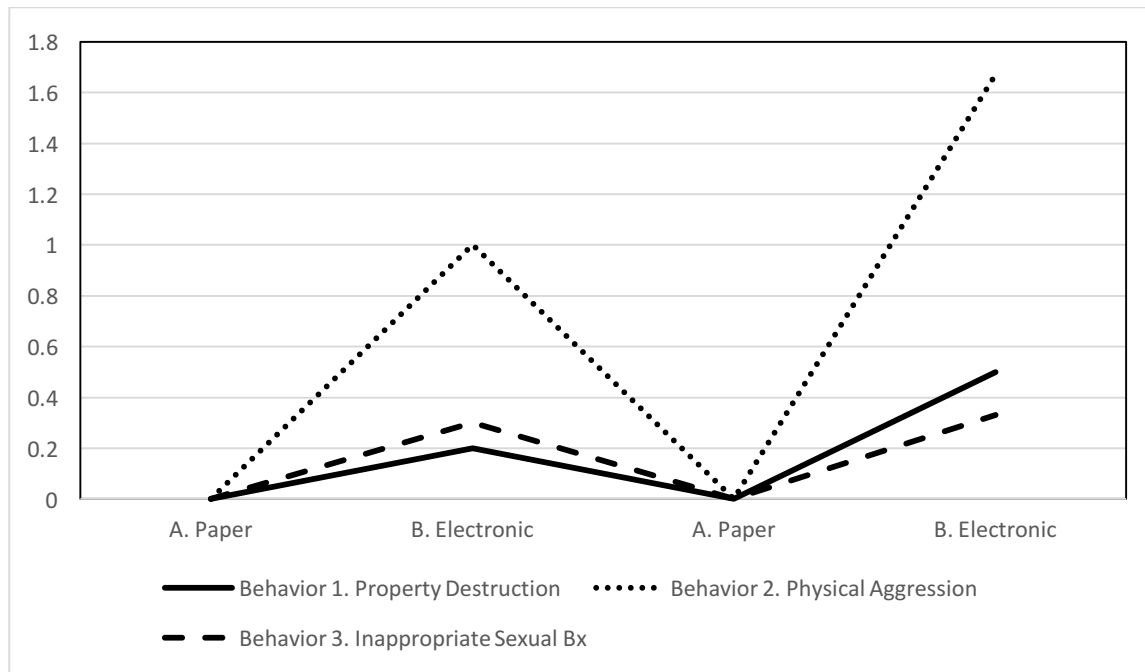


Figure 12. Client 3 comparison of charting

Correlation Between Data Collected and Ratings of Video Recordings

No significant correlation was found between the frequency of target behaviors obtained by the video raters and either the paper or electronic charting.

The relationship between the video rating and the iPhone frequencies for client 3 was marginally significant, $r\tau = .428$, one tailed $p = .065$. The relationship between the video rating and the iPhone frequencies for client 1 was not significant, $r\tau = .110$, one tailed $p = .328$.

Correlations could not be computed for samples involving paper coding due to zero variance in the frequencies (i.e., no behaviors were charted).

The data collected by the video coders suggests a higher frequency of behaviors occurred than were charted by staff members using either the paper or electronic charting device. This implies that either the video coding was inaccurate or the staff were not able to accurately capture the frequencies of the target behaviors in this setting. This hypothesis was not supported.

Table 2

Staff and Video Rater Frequencies

Sample	Modality	Behavior 1		Behavior 2		Behavior 3	
		Rater	Staff	Rater	Staff	Rater	Staff
Client 1							
1	Paper	53	0	12	0	0	0
2	Paper	28	0	7	0	0	0
3	Electronic	28	0	10	0	0	0
4	Electronic	14	2	10	1	0	0
5	Paper	4	0	4	0	0	0
6	Paper	19	0	11	0	0	0
7	Electronic	14	0	12	1	0	1
8	Electronic	29	4	7	4	0	2
Client 3							
1	Paper	0	0	0	0	0	0
2	Paper	0	0	0	0	0	0
3	Electronic	0	0	0	2	0	1
4	Electronic	0	0	0	0	0	0
5	Paper	0	0	3	0	11	0
6	Paper	0	0	1	0	3	0
7	Electronic	0	0	2	1	0	1
8	Electronic	0	1	1	2	0	0

Post-Hoc Analysis

Factor analysis of attitudes scales from the first survey. A principle components analysts with varimax rotation was completed on the attitudes scales items. Six components emerged: dissatisfaction with the status quo; attitudes towards support; attitudes towards paperwork; efficacy; optimism; and utility of charting. Given the small sample size ($N = 10$), items were included if they loaded above a .8.

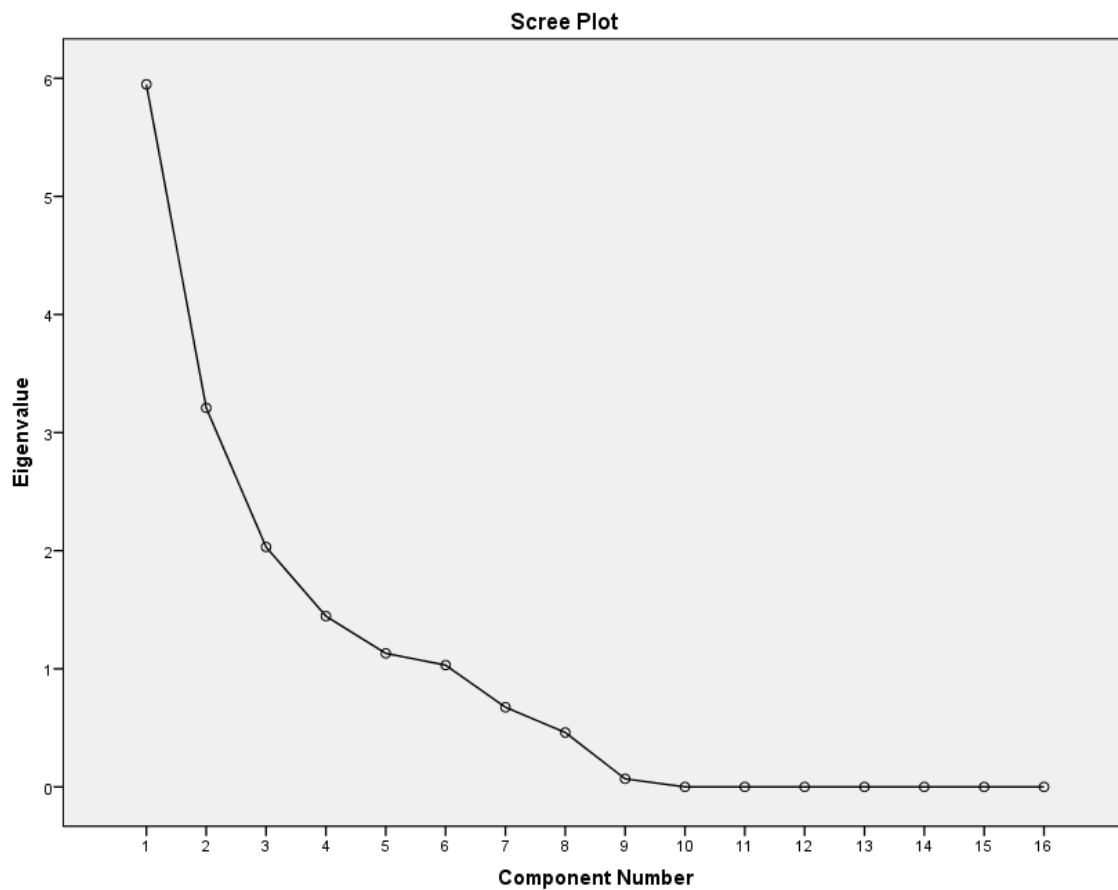


Figure 13. Scree Plot produced by Principal Component Analysis

Table 3

6 Factor Loadings for the Attitudes Scales Items

Item	Component					
	1	2	3	4	5	6
Many of the individuals I work with have challenging behaviors.	.556	.266	-.087	.668	-.186	-.039
Challenging behaviors can be changed.	-.018	.162	.804	-.327	-.404	.092
I feel that I can help reduce challenging behaviors.	.257	.040	.353	-.824	-.118	-.210
I feel that I receive adequate support to change challenging behavior	-.112	.890	.102	.245	-.176	-.010
The individuals I work with will never get any “better”.	.125	-.121	-.201	.000	.847	.030
I have witnessed people with challenging behaviors improve.	-.912	-.290	.180	.187	-.067	.024
Behavior charting/paperwork helps me change challenging behaviors.	-.562	-.662	.250	.207	.215	-.074
Behavior charting/paperwork allows me to better talk with consultants about behavior.	.178	.908	-.013	-.015	-.042	.002
Behavior charting/paperwork about challenging behaviors is unnecessary.	-.064	.010	-.010	.090	.015	.989
I wish I could do my job without completing behavior charting/paperwork.	.906	-.140	.106	.091	-.004	-.122
Behavior charting/paperwork takes too much time.	.240	.177	.802	-.392	-.274	.076
I feel that if I complete behavior charting/paperwork inaccurately I may lose my job.	-.423	-.554	.044	.475	.503	-.071
I worry about how accurately I complete behavior charting/paperwork.	-.266	-.159	.924	.102	.135	-.136
I wish there was a way I could chart behaviors more quickly.	-.243	-.703	-.028	.412	-.418	-.011
I am open to using a computer or other electronic device to chart behaviors.	.550	.665	.320	.028	-.265	.008
I think that individuals with challenging behaviors would improve with other kinds of charting.	.865	.355	-.051	-.161	.263	.056

Table 4

Principal Components Analysis Total Variance Explained

Rotation Sums of Squared Loadings			
Component	Total	% of Variance	Cumulative %
1	5.949	37.180	37.180
2	3.209	20.054	57.234
3	2.031	12.694	69.928
4	1.446	9.036	78.964
5	1.131	7.066	86.030
6	1.031	6.445	92.475

Extraction Method: Principal Components Analysis.

Attitudes scale change. The survey data could not be linked as 70% of participants were unable to remember the four digit code intended to link their data from the first and second survey data together. Thus, to evaluate aggregate change in attitudes, data from the first and second survey were treated as independent samples.

An independent sample t-test was run for all survey items. A t-test not assuming homogeneity of variance was used for items for which Levene's test for equality of variances was violated. Eight of the sixteen survey items demonstrated change following the experiment. Additionally, an independent sample t-test was run for each subscale and for the whole attitudes scale. Cases were excluded from analysis if any items were not answered. The "Attitudes Towards Behavior Charting" subscale and "Attitudes Towards Electronic Behavior Charting" demonstrated change from the first survey to the second survey. See table 5.

Three participants did remember their code and their surveys were linked from the first administration to the second survey administration. All three of these individuals did not participate in the charting portion of the study. A dependent sample t-test was run for each item and each subscale. Cases were excluded from each subscale analysis if any items were not answered. Two of the items related to electronic charting and all three subscales were significantly different at follow up. Given the small sample size, this data should be interpreted cautiously. See table 6.

Table 5

Differences Between Survey 1 and Survey 2 (Independent)

Item or Subscale	Survey 1		Survey 2		Sig. 2 Tailed
	Mean	Std. Dev	Mean	Std. Dev	
Many of the individuals I work with have challenging behaviors.	2.00	1.323	3.20	2.658	.238
Challenging behaviors can be changed.	3.80	2.300	4.50	2.121	.488
I feel that I can help reduce challenging behaviors.	2.90	2.331	4.10	1.792	.213
I feel that I receive adequate support to change challenging behavior	1.38	0.744	2.90	2.234	.067*
The individuals I work with will never get any “better”.	1.56	1.014	4.70	1.829	.000
I have witnessed people with challenging behaviors improve.	8.20	2.860	4.90	3.281	.028
Behavior charting/paperwork helps me change challenging behaviors.	6.56	4.157	3.40	1.506	.038
Behavior charting/paperwork allows me to better talk with consultants about behavior.	4.44	3.005	6.30	3.093	.203
Behavior charting/paperwork about challenging behaviors is unnecessary.	1.50	1.581	7.70	2.830	.000
I wish I could do my job without completing behavior charting/paperwork.	1.70	1.337	3.40	1.578	.018
Behavior charting/paperwork takes too much time.	4.33	3.082	2.90	1.449	.229*
I feel that if I complete behavior charting/paperwork inaccurately I may lose my job.	4.90	3.143	3.20	3.327	.255
I worry about how accurately I complete behavior charting/paperwork.	5.70	2.163	2.00	1.633	.000
I wish there was a way I could chart behaviors more quickly.	9.78	0.667	3.10	2.726	.000
I am open to using a computer or other electronic device to chart behaviors.	5.33	2.398	2.70	1.418	.009
I think that individuals with challenging behaviors would improve with other kinds of charting.	1.44	0.882	3.40	2.914	.069*
“Ability to Change” Subscale	27.88	5.357	25.90	4.886	.426
“Attitudes Towards Behavior Charting” Subscale	48.38	3.889	38.50	3.923	.000
“Attitudes Towards Electronic Behavior Charting” Subscale	16.50	2.828	9.20	2.616	.000
Combined Subscales/Attitude Survey Composite	92.75	7.924	73.60	6.963	.532

*Equal variances not assumed

Table 6

Differences Between Survey 1 and Survey 2 (Dependent)

Item or Subscale	Survey 1		Survey 2		Valid Cases	Sig. 2 Tailed
	Mean	Std. Dev	Mean	Std. Dev		
Many of the individuals I work with have challenging behaviors.	3.00	1.732	2.67	2.082	3	.154
Challenging behaviors can be changed.	4.00	3.606	5.00	3.000	3	.154
I feel that I can help reduce challenging behaviors.	3.67	3.055	4.00	3.606	3	.942
I feel that I receive adequate support to change challenging behavior	1.00	.000	4.50	.707	2	*
The individuals I work with will never get any "better".	1.33	.577	6.33	.577	3	.333
I have witnessed people with challenging behaviors improve.	7.33	4.619	8.00	2.000	3	.927
Behavior charting/paperwork helps me change challenging behaviors.	7.33	4.619	3.67	2.517	3	*
Behavior charting/paperwork allows me to better talk with consultants about behavior.	2.67	1.528	9.00	.000	3	*
Behavior charting/paperwork about challenging behaviors is unnecessary.	1.00	.000	8.67	2.309	3	.788
I wish I could do my job without completing behavior charting/paperwork.	2.33	2.309	4.00	2.646	3	.707
Behavior charting/paperwork takes too much time.	5.33	4.509	3.00	2.000	3	.407
I feel that if I complete behavior charting/paperwork inaccurately I may lose my job.	5.33	2.517	2.00	1.732	3	.454
I worry about how accurately I complete behavior charting/paperwork.	6.67	3.055	2.33	2.309	3	*
I wish there was a way I could chart behaviors more quickly.	10.00	.000	5.67	3.055	3	.667
I am open to using a computer or other electronic device to chart behaviors.	6.00	1.000	2.00	1.000	3	.000
I think that individuals with challenging behaviors would improve with other kinds of charting.	1.67	1.155	2.33	2.309	3	.000
"Ability to Change" Subscale	29.50	10.607	31.50	2.121	2	.000
"Attitudes Towards Behavior Charting" Subscale	44.00	5.657	41.00	4.243	2	.000
"Attitudes Towards Electronic Behavior Charting" Subscale	18.00	2.828	9.50	4.950	2	.000
Combined Subscales/Attitude Survey Composite	91.50	13.435	82.00	1.414	2	.154

*The t cannot be computed because the standard error of the difference is 0

Racial Ingroup Identification Index. The Racial Ingroup Identification Index were scored according to the instrument author's instructions. The scores for all 10 survey participants could be computed.

Relationship to attitudes composite scale. A standard regression analysis was conducted with the Racial Ingroup Identification Index as the dependent variable and the Attitudes Composite Scale as the independent variable. There was no significant relationship between the the Racial Ingroup Identification and the Attitudes Composite Scale Index, $F(1,6) = 1.764, p = 0.232$.

Relationship to attitudes subscales. A standard regression analysis was conducted with the Racial Ingroup Identification Index as the dependent variable and the Ability to Change Subscale, Attitudes Towards Behavior Charting Subscale, and the Attitudes Towards Electronic Behavior Charting Subscale as the independent variables. There was no significant relationship between the Racial Ingroup Identification Index and the attitudes subscales, $F(3,4) = 0.401, p = 0.761$.

Big Five Mini-Modular Markers. A total of five participants, one male and four females, completed Saucier's (2002) 40-item personality inventory. Other participants omitted items or did not complete this portion of the survey. Items were scored to produce the following indices: openness, consciousness, extraversion, agreeableness, and neuroticism (or, its inverse, emotional stability) in accordance with the instrument author's instructions.

Relationship to attitudes composite scale. A standard multiple regression analysis was conducted with the Attitudes Composite Scale as the dependent variable and openness, consciousness, extraversion, agreeableness, and neuroticism as the independent variables.

Extraversion was significantly related to the Attitudes Composite Scale, $F(1,3) = 55.89$, $p = 0.005$. The regression equation was: $\text{AttitudesCompositeScale} = 5.353 + 1.652 \times \text{Extraversion}$.

Relationship to attitudes subscales. A standard multiple regression analysis was conducted with the Ability to Change Subscale as the dependent variable and openness, consciousness, extraversion, agreeableness, and neuroticism as the independent variables. Extraversion was significantly related to the Ability to Change Subscale $F(1,3) = 77.962$, $p = 0.003$. The regression equation was: $\text{AbilityToChangeSubscale} = -22.235 + 0.944 \times \text{Extraversion}$.

A standard multiple regression analysis was conducted with the Attitudes Towards Behavior Charting Subscale as the dependent variable and openness, consciousness, extraversion, agreeableness, and neuroticism as the independent variables. No significant relationship was found ($p > 0.05$)

A standard multiple regression analysis was conducted with the Attitudes Towards Electronic Behavior Charting Subscale as the dependent variable and openness, consciousness, extraversion, agreeableness, and neuroticism as the independent variables. No significant relationship was found ($p > 0.05$)

Relationship to Racial Ingroup Identification Index. A standard multiple regression analysis was conducted with the Racial Ingroup Identification Index as the dependent variable and openness, consciousness, extraversion, agreeableness, and neuroticism as the independent variables. No significant relationship was found ($p > 0.05$)

Charting behavior. Across all three clients observed, staff members created a total of 671 entries into the electronic charting software. Of these entries, approximately 81.2% indicated that no behavior occurred; approximately 1 out of 5 times staff utilized the electronic

charting device they charted the occurrence of a target behavior. Charting for clients was comparable: there were 281 entries for client one, 178 entries for client 2, and 212 entries for client 3.

On average, for each client that they observed, staff members charted approximately 22 times per a day that staff was instructed to chart. On the days which staff actually utilized the electronic charting devices, they charted approximately approximately 29 times per each client observed. Altogether, staff utilized the electronic charting system for 23 days out of the 30 days for which they were instructed, or about 77% of the time.

Staff members activated the error correction feature of the software (by shaking the phone) a total of 20 times and corrected 18 errors. This suggests that the error correction feature was not erroneously activated frequently.

CHAPTER IV

Discussion

The purpose of the present study was to design a program which would enable the electronic charting of problematic behaviors in an adult population with developmental disabilities and evaluate the effect of the program in an applied setting.

Comparison of the Frequency of Electronic Charting and Paper Charting

Hypothesis one consisted of the evaluation of the charting behavior of staff members. Staff member charted considerably more behaviors via electronic means than via paper means than would be expected by chance. Thus, it appears that the frequency of charting is improved when staff utilized an electronic device for charting. There are several factors which may have contributed the higher frequency of charting via electronic means.

First, the charting device was always available and powered on. This reduced the effort that staff had to expend to chart. Paper charts were often located in binders on an adjacent table because, due to their size, they would interfere with staff members' other activities (e.g., art project with consumer). The phone used for charting occupied a much smaller footprint which allowed it to be placed on the same table where they were working. Moreover, staff members did not need to obtain a pencil or pen to chart; they could simply use their finger.

Second, the electronic charting device provided reminders to chart, ten minutes from the time that charting last took place. Staff members in this setting were assigned to monitor two to six consumers at a time; this would be expected to tax staff members working memory. Given these demands, staff members would be expected to forget to chart on a regular basis and fail to remember the number of target behaviors that did occur if they charted at the end of their shift. The color of the charting device screen would change after 10 minutes, turning yellow to indicate

the need to chart, and the device would vibrate. Eleven minutes since charting last occurred, the screen of the device would then turn pink to signal that charting was overdue. Every minute thereafter, the device produced an audible alert and vibrated. The color of the screen and audible alert would indicate to other staff members that charting was not completed as required. Thus, staff members' behavior was negatively reinforced: after charting the alert would cease and other staff members would no longer be made aware the staff member's failure to chart. In contrast, paper charts were audited approximately on a weekly basis by managers. Thus, any reprimand for non-compliance with charting would be delivered infrequently and there was no immediate consequence for not charting as required. Moreover, if staff simply wrote any number in the box corresponding to the target behaviors on the paper charting form, they would not be reprimanded. In regards to other contingences, staff members could chart 0 behaviors on the paper form and be praised for their desirable outcome. Indeed, this may be the reason that very few behaviors were charted on the paper sheets.

Correlation Between Data Collected and Ratings of Video Recordings

Video recordings were rated in an effort to determine the accuracy of the staff members' charting. While no consistent relationship was found, there was a marginally significant relationship between the behaviors charted by staff members and video rating by a doctoral clinical psychology student for one client. Three possibilities exist for this phenomenon: behaviors were charted inaccurately by the staff member, behaviors were charted inaccurately by the video raters, or behaviors were charted inaccurately by both video raters and staff members.

Operational definitions are specific definitions of behavior created in order to promote interrater reliability. The same operational definitions were provided to staff members and video raters. However, when charting via electronic means, the list of operational definitions was not

readily accessible. On the paper form, the operational definition of each target behaviors were listed on the reverse side of the form. It is unclear whether staff utilized this information. Staff members were also provided with training on the meaning of these operational definitions. It is possible that staff members reduced the meaning of the target behavior down to the label listed on the paper form or in the program and did not capture the nuance of the definition. For example, when client one was not wearing his helmet and standing (“Target Behavior #2: Refusing to Wear Helmet”), this behavior was charted. However, this behavior was only charted episodically; per the operational definition staff were not instructed to chart this behavior again unless 15 minutes without the behavior had passed. If staff did not adhere to the 15 minute guideline they may have over reported this client’s behavior. Likewise, attention seeking behavior (Target Behavior # 3: Attention Seeking Behavior”) for client one only referred to instances when he feigned a seizure, not any behavior with an attention contingency. If staff did not remember this definition they may have over reported this behavior.

Video raters tended to observe more behaviors than were observed by staff members. This may be due to the attention that they were able to place on one client, whereas staff members had to attend to many clients. In contrast to the staff members, they had a list of operational definitions for each behavior readily available and could pause, rewind, and resume a video as needed. However, it is also possible that the video raters inaccurately coded information.

For example, as video was accelerated they may have over reported behaviors based on time, such as the helmet behavior described above. However, the VideoCoder program has measures intended to mitigate this effect (i.e., listed how many minutes past since each behavior

has been charted). Thus, it seems probable that inaccuracy would most likely have occurred at the day program due to other competing task demands.

Survey

Ten staff members completed the initial survey. Seven out of ten staff members did not recall the four-digit identification number they selected at the follow up survey. Moreover, staff members did not indicate whether they utilized the electronic charting device or not on the second survey as instructed. Thus, it is not possible to evaluate whether staff's attitudes changed in regards to behavior modification and behavior charting following the use of the electronic charting device.

Given the nature of the environment at the behavior modification day program, it is unclear whether this data, if it had been collected as intended, would have compellingly demonstrated attitudes toward change. As the attitudes measure was experimental, the stability of scores on the measure had not been established. Additionally, it was unclear whether a relationship exists between items on this measure and the behavior of staff members.

Survey Post-Hoc Analyses

Generally, it appears that attitudes towards charting and behavior change decreased at follow up. This may be due to a decrease in general morale or changes in the work environment that occurred throughout the course of the study. This may also be due to dissatisfaction with the charting device. For example, it is possible that staff members who did not use the electronic charting devices observed others charting with the electronic device and decided that they did not want to chart electronically. In that scenario, it is possible that they expressed their pessimism about both paper and electronic charting in the follow up survey.

It is important to consider that possibility that items on the survey may impact certain minority groups disparately (i.e., disparate impact). While no relationship was found in this study between the attitudes scales and racial identity, a more varied population and greater sample size could produce different results.

The Attitudes Scales Composite and the Ability to Change Subscale scores are related to extraversion. A job as a behavior interventionist largely involves the interacting in public and private settings with adults with developmental disabilities, teaching these individuals, and providing feedback to these individuals. These tasks might be regarded as extraverted behaviors. Thus, is sensible that staff members who have more extraverted traits may be more likely to engage with clients effectively and thus have higher opinions about the possibility that clients can change their behavior.

Future Directions

Electronic recordkeeping will likely continue to grow. Future studies might focus on improving the accuracy of charting via electronic means and experimentally refine the interface of the charting software and the timing and format of the charting reminders to promote accurate data collection. It may be fruitful to examine the impact that these tools have on longer term client outcomes. Electronic charting may also be helpful for tracking adaptive skills that clients need to develop in order to live more independently. Subsequent studies may design and evaluate a program focused on the development of these skills.

While paper charting often involves staff to count the occurrences of target behaviors for the purposes of report writing and reporting to supervising agencies, electronic data and automated data analysis can simplify this process, saving money. Future studies might focus on the development of software that could automatically produce meaningful reports, make

recommendations, and display collected data in a way that improves client outcomes, meets regulatory requirements, and reduces caretaker fatigue.

The video coding tool developed for this study may serve template for future quality control and auditing instrumentation. For example, staff could audit one hour of staff charting time in approximately 10 minutes utilizing the tool used in this study, on a weekly basis, thereby improving staff charting accuracy.

Staff selection continues to be an important part of the management of a workplace that serves vulnerable populations. To this end, an experimental survey was included in the study. Six factors emerged from the survey. Further exploration of these domains may promote the development of a tool to assist with employee selection. Staff members who hold positive beliefs about behavior modification and charting may be better candidates to work with adults in developmental disabilities. If these attitudes are stable and meaningfully related to their job performance, the selection of staff well matched to behavior modification may promote client outcomes, reduce caretaker fatigue, and reduce costs associated with rehabilitation and the development of life improving skills for individuals with developmental disabilities. Moreover, if a tool to measure these beliefs were validated, it would be possible to examine the efficacy of interventions to increase staff members' feelings of efficacy and desire to chart. In the interim, managers might consider the implication of these domains when interviewing.

CHAPTER V

Conclusion

Evidence based behavior modification will continue to be an important part of improving life for individuals with severe developmental disabilities. In service of evidence based interventions, data collection is often required. The findings from this study suggest that electronic charting can empower staff members who work with this population to chart the occurrence of maladaptive behaviors substantially more frequently and possibly more accurately than via paper means.

The charting device software developed for the purposes of this study is suited for deployment in group settings where staff have to manage multiple clients and need a quick way to log the occurrences of behaviors. The electronic nature of the data enables behavior consultants and other stakeholders to examine data as needed.

This study also demonstrated that video based auditing of target behaviors is feasible and relatively expedient when the video is played back a rate greater than real time. However, additional research is needed in order to determine an ideal sample size and methodology for auditing.

The survey utilized in this study represents a first step towards a staff selection tool. The following domains were identified: dissatisfaction with the status quo; attitudes towards support; attitudes towards paperwork; efficacy; optimism; and utility of charting. Subsequent studies may examine the behavioral correlates of these domains and refine an instrument that may enable the selection of staff well suited to behavior modification jobs.

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APPENDIX A

Extended Literature Review

Applied Behavioral Analysis

Applied Behavioral Analysis (ABA) utilizes behavior tracking to gather information about the antecedent conditions, the environment, and the consequences of a behavior. Behavior tracking is both an intervention and generative in the development of interventions.

In the first case, behavior tracking informs the tracker that behaviors occur through causal mechanisms. This tracking encourages the individual tracking the behavior to examine the ways that individuals and the environment shape the behavior of the client. In a cognitive behavioral frame, this may be referred to as mindfulness.

In the second case, behavior tracking is investigative. After behavior is charted the data are commonly provided to a consultant. The data allow consultants to look at a behavior, its frequency, antecedents, time of occurrence, and contingencies in order to determine the function of a behavior. Once a function of a behavior is determined, interventions can be developed and deployed. In its simplest form, tracking may elucidate the antecedents to a behavior. Clients can be redirected at the antecedent level and prevent a behavior from occurring.

Much of the ABA literature is aimed at early intervention for autism spectrum disorders. In these cases, behavior is tracked by a family member or employee (sometimes referred to as a “behaviorist”, “behavior specialist”, or “behavior therapist”; these titles are not regulated by the board of psychology or other institution) in a 1:1 setting (i.e., 1:1 ratio of developmentally disabled client to support staff or family member).

Due to the success in 1:1 settings, the ABA model has been applied to residential facilities where developmentally disabled adults reside. It has also been applied to community based day programs. Individuals in these settings often have diagnoses of intellectual disability, autism spectrum disorder, mood disorders, and/or a psychotic disorder. Some of these individuals have severe maladaptive behaviors that endanger themselves and others. In

acknowledgment of this, some states have instituted a system of graded care. In California, for example, care is assigned based on “Service Levels” which determine, among other things, the amount of staff support and resources provided to an individual in a “Community Care Facility” (Cal. Code of Regulations Title 17, Division 2, Chapter 3 §56004). Consultants in these settings are hired to provide training to the staff, owners, and managers of residential facilities.

Consultants in these settings provide staff with evidence-based interventions and employ ABA style tracking.

Statement of the Problem

Applied behavioral analysis and the associated interventions greatly improve the quality of life for developmentally disabled individuals in these care facilities by helping them reduce their maladaptive behaviors. However, the daily charting required of staff at these facilities as part of these interventions can be onerous. Two common models for behavior charting exist and sometimes occur simultaneously. Prior to charting, target behaviors, which are essentially consultant-identified clusters of maladaptive behaviors (e.g., “Physical Aggression”, “Self-Injurious Behavior”), are determined, usually by interview, observation, review of client history, and data collection. Then residential staff charts the occurrences of behaviors in one of a few ways. In the first case, staff are instructed to place a tally mark next to the date and the target behavior on a Behavior Data Sheet (BDS) immediately after the client has completed the target behaviors and is stable (i.e., safe). In the second case, staff are instructed to complete an Antecedent-Behavior-Consequence (ABC) sheet for the client after the client has completed a target behavior (or in the case of exploration, any problematic behavior). On this sheet a staff member is to write down the date, time, a description of the observed behavior, the environment in which it occurs, and what the staff did to address the behavior. In the third case, staff members may be asked to both place a tally mark next to the target behavior and complete an

ABC sheet. Each type of tracking is time consuming and can take between one and ten minutes to complete thoroughly. Cultural differences between consultants and staff, most prominently language differences, complicate the process of behavior charting, especially in the more verbose ABC form.

The time commitment and difficulty of charting often result in poor staff charting of maladaptive behaviors. Consequently, staff members often fail to buy into the behavioral model of behavior modification. Staff may remark that the client “is just that way” or suggest that a maladaptive behavior is immutable. Charting then becomes a daily chore with little or no apparent utility to the individual staff member. Consultants may observe incomplete charting or (as is often the case in situations where there is pressure to chart from facility administrators) inaccurate charting. Charting may be done at the end of a staff member’s shift. In these cases, a staff member may simply attempt to recall the frequency of a behavior and place tally marks accordingly. In a facility of four clients with three target behaviors each, over the course of a four-hour shift the limits of short-term memory are easily exhausted. ABC sheets in a busy residential facility may be similarly completed at the end of a shift, resulting in inaccurate data.

Daniel Cayem, a Board Certified Behavior Analyst, elaborates, “Data collection is frequently a problem in that staff have tons of other responsibility, including meal preparation, house cleaning, Occupational Therapy data collection, Recreation data collection, speech and language data collection and any other special incident report recording that is required for licensing or regional centers. Furthermore, behavior consultants have limited direct contact with consumers and rely heavily on the data collection provided by direct care staff. When direct care staff are overworked, stressed out and required to document on multiple domains, the only

source of information a consultant has suffers and therefore behavior intervention plans lose effectiveness” (D. Cayem, personal communication, September 27, 2014).

Even when behavior tracking is completed ideally, BDS sheets do not capture the time that a client engaged in a behavior. This information is eminently useful. If, for example, a consultant was aware that self-injurious behavior was identified prior to lunch on a daily basis, he or she may posit that hunger or rituals associated with lunch may be associated with the self-injury. While ABC sheets in these settings may capture more information, they are not often ideal in most residential facilities (as least beyond an initial period) due to the time commitment required to complete them thoroughly. This type of charting is usually reserved for the most severe (as measured by harm or potential harm to the client) and infrequent behaviors (e.g., client leaving the facility unattended). There currently exists no clear solution to these problems.

One current way of addressing inaccuracy in behavior charting is to utilize mechanical incremental counters for each behavior. These can be heavy, fragile, and still fail to capture the time that a client engaged in a behavior. As with other methods, this method is subject to staff inaccuracy (whether intentional or unintentional) and there is no way to verify authenticity of data or provide accountability.

Electronic behavior charting is a possible alternative that has more recently become a possibility due to substantial cost reductions in consumer electronic devices. There are some commercial products now offering electronic recording keeping for development disabilities; some of these services provide a companion application for mobile devices. Using these mobile applications staff can input documentation without a traditional desktop or laptop computer. For example, Therap offers electronic web based charting for individuals with developmental

disabilities (Web-Based Documentation and Communication Software System for Providers Supporting People with Developmental Disabilities, n.d.).

However, this field is immature, with few companies providing commercial solutions. It is also unclear how different charting modalities (paper versus electronic) affect the behavior of the staff charting the behavior. This is inherently a difficult problem to study, as individual residential facilities do not lend themselves well to large-scale research that would likely be necessary to demonstrate any effects. The present study seeks to compare paper charting to electronic charting of target behaviors in a local behavioral management day program.

Computer assisted record keeping has more recently become common in healthcare. Garrido, Jamieson, Zhou, Wiesenthal, and Liang (2005) evaluated the impact of an electronic record keeping system on treatment in two Kaiser Permanente regions. They found a 9% decrease in office visits, which the authors attribute to the electronic record keeping system.

Zeman, Johnson, Arfken, Smith, Opoku (2006) discuss some of the challenges of implementing a personal digital assistant (PDA) in health care settings. The authors identify 10 considerations for electronic charting via PDA in a hospital. The authors caution that the appropriate software should be selected, suggesting that it be compatible and interoperable with current systems. They also discuss security concerns, noting that mobile applications must be secure and patients in their settings had difficulty remembering usernames and passwords. They found that in their settings most individuals could operate a PDA, but cautioned that not all users may be literate in a healthcare setting. The authors also noted that physician interest (i.e., desire to use) in electronic charting was an important component of implementation.

Terminology

Operant Conditioning and Types of Reinforcement. Skinner (1953) notes that Thorndike (1898) first studied the consequences of behavior. Thorndike describes “associations”

that an animal makes between behavior and a consequence. Thorndike (1898) explains, “if it can be made a direct question of pleasure or pain to an animal, he [the animal] can associate any number of acts to different stimuli” (p. 98). In essence, Thorndike had linked the consequences (pain or pleasure) that result in the environment of an animal to learning and behavior of the animal.

Skinner (1953) significantly elaborated on the consequences of behavior. Skinner elegantly notes (1953), “the only way to tell whether or not a given event is reinforcing to a given organism under given conditions is to make a direct test” (p. 73). He developed a taxonomy, “operant conditioning”, that describes this process. Reinforcers that “consist of presenting something” are referred to as “positive reinforcers” (Skinner, 1953, p. 73). Similarly, reinforcers that “consist of removing something” are referred to as “negative reinforcers” (Skinner, 1953, p. 73). Positive in this sense refers to the addition of a stimulus; negative refers to the subtraction of a stimulus.

These concepts apply to people as well as other organisms. These principles provide a framework for a rudimentary understanding of behavior regardless of language. This is especially salient, given that individuals with developmental disabilities often lack the ability to communicate verbally.

Applied Behavior Analysis. Applied Behavior Analysis (ABA) is, most broadly, the study of behavior, application of targeted interventions, and evaluation of interventions on behavior. Wolf and Risley (1968) explain, “Analytic behavioral application is the process of applying sometimes tentative principles of behavior to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes noted are indeed attributable to the process of application – and if so, to what part of the process” (p. 91). They further explain that

this is a necessarily messy process, since it does not usually occur under laboratory settings; it is “applied” in real settings.

Functional Behavioral Analysis. Gresham, Watson, and Skinner (2001) explain that functional behavioral analysis is “a collection of methods for gathering information about antecedents, behaviors, and consequences in order to determine the reason (function) of behavior” (p. 158). In this process behaviors are assumed to serve some function. The purpose of the functional behavioral analysis is to uncover the function of a behavior, not to simply describe it. Once a function of the behavior is identified, a behavior can be modified while still allowing a person to meet their needs. For example, if an individual screams when they are hungry, initially it may not be obvious to an observer that screaming is a way that the person signals that they would like food. If screaming occurs every night around 6:00 PM, a few minutes before dinner is served at 6:15 PM, the time may be an important antecedent to the behavior. Once caretakers understand this relationship between the behavior and the function of the behavior they may work to teach the individual a more adaptive way of signaling hunger (e.g., sign language) or ensure that dinner is served precisely at the same time every evening.

Hanley, Iwata, and McCord (2003) note that there are two types of functional analysis methodologies commonly used. There is the “AB (antecedent-behavior) model” and the “ABC model” (Hanley, Iwata, & McCord, 2003, p. 151). In this acronym, “A” refers to “antecedent”, “B” refers to “behavior”, and “C” refers to “consequence”. An antecedent is quite simply an event that precedes a behavior. A behavior generally refers to a maladaptive behavior (e.g., self-injury, physically aggressive behavior). A consequence is concerned with the contingency that follows a behavior (e.g., staff reinforcement, environmental reinforcement, natural reinforcement).

Carr and Durand (1985) demonstrate an early variant of the antecedent behavior model. In a within subjects factorial design, the authors evaluated the effect of attention from an adult and the difficulty of tasks on “disruptive behavior” of a child. Adults were prompted to attend to the child either for one third of the intervals or consistently, and the child was prompted to complete both difficult tasks and easy tasks. Carr and Durand (1985) found that children engaged in disruptive behavior during difficult tasks when the adult was not attending to the child. The study demonstrates the importance of preceding events (in other literature referred to as “antecedents”) on behavior.

Iwata, Dorsey, Slifer, Bauman, and Richman (1982) demonstrate an early variant of the antecedent behavior consequence model. In an experimental design, the researchers placed an individual in a variety of environments and varied the amount and type of interaction the individual had with the experimenter. They found that the type of reinforcement provided insight into the behavior. For example, the researchers posited that when an individual engaged in self-injurious behavior while alone, the function of the behavior was self-stimulation. Conversely, some individuals engaged in self-injurious behavior when subjected to academic demands. The researchers posited that for these individuals, the behavior sought to elicit intervention from staff. Importantly, the consequences in this model provided insight into the function of the behavior.

Developmental Disability. Developmental disability broadly refers to a disability that occurs during a developmental period. For the current purposes, two will be considered: Autism Spectrum Disorder and Intellectual Disability.

Intellectual Disability: The Diagnostic and Statistical Manual for Mental Disorders 5 defines intellectual disability as “a disorder with onset during the developmental period that

includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains” (American Psychiatric Association, 2013, p. 33). Prior to 2010 and before the passage of Rosa’s Law by the United States Congress, “intellectual disability” was referred to as “mental retardation”. Rosa’s Law replaced the term “mental retardation” (and its variants) with “intellectual disability” (and its variants) (Rosa’s Law, 2010). The Diagnostic and Statistical Manual for Mental Disorders IV Text Revision, noted that “mental retardation” is “characterized by significantly sub average intellectual functioning (an IQ of approximately 70 or below) with onset before age 18 years and concurrent deficits or impairments in adaptive functioning” (American Psychiatric Association, 2000, p. 39). The Diagnostic and Statistical Manual for Mental Disorders 5 does not contain IQ criteria for each level of intellectual disability. However, the clinician is encouraged to evaluate the level of adaptive functioning and functional impairment before making a diagnosis.

Autism Spectrum Disorder: This disorder is defined in the Diagnostic and Statistical Manual for Mental Disorders 5 as characterized by “persistent deficits in social communication and social interaction across multiple contexts”, and “restricted, repetitive patterns of behavior, interests, or activities” (American Psychiatric Association, 2013, 50). Notably, “symptoms must be present in the early developmental period” and there must be “clinically significant impairment in social, occupation, or other important areas of current functioning” (American Psychiatric Association, 2013, p. 50). “Autistic disorder”, “Asperger’s disorder”, and “pervasive developmental disorder not otherwise specified” in the Diagnostic and Statistical Manual for Mental Disorders IV Text Revision have now been collapsed into one category called “Autism Spectrum Disorder” (American Psychiatric Association, 2013, p. 51).

Consumer. The regional centers consider individuals with developmental disabilities “consumers” of their services (Disability Rights California, 2012, p. 6).

History of ABA for Developmental Disability

Mace (1994) traces the first systematic behavioral analysis of maladaptive behaviors to 1982. In their seminal paper, Iwata, Dorsey, Slifer, Bauman, and Richman (1982) studied nine individuals with developmental disabilities. These individuals were placed in a variety of environments (environments intended to simulate “social disapproval”, “academic demand”, “unstructured play”, and “alone”) (Iwata et al., 1982, pp. 201-203). Researchers coded the frequency of self-injurious behavior as either occurring or not occurring every 10 seconds (i.e., time sampling). The authors found that different individuals exhibited different amount of self-injurious behavior in different environments. This analysis methodology emphasized the need to individualize the study of individuals as well as the need to consider the environment (both at the antecedent and consequence levels).

Relevant Legislation

Mechanic and Rochefort (1990) trace the origins of deinstitutionalization to John F. Kennedy. The Community Mental Health Centers Act of 1963 attempted to reduce the population of individuals in institutional settings (Mechanic & Rochefort, 1990).

In California, the site of the present study, additional legislation has prescribed treatment and support for individuals with developmental disabilities. John (2011) notes that California is the only state to provide this level of support.

May and Hughes (1987) trace the history of support for individuals with developmental disabilities in California. They note that the Lanterman Mental Retardation Act of 1969 was the first major reform. This act was revised in 1972 and 1976. In order to qualify under the act a person must have a developmental disability with onset before age 18 that is expected to be

permanent. The act provides “alternatives for institutional care” and establishes how the care is made available, including establishing the bureaucracy that can deliver such care (p. 217). The authors note that the Lanterman Act represents a departure from previous approaches to developmental disabilities and “restate[s] the ‘problem’ of mental handicap in terms of rights, rather than needs” (p. 291). John (2011) consequently terms the program an “entitlement” (p. V).

May and Hughes (1987) noted that the act supports “a free market philosophy” that results in purchase of services from vendors for developmentally disabled consumers. “Regional Centers”, essentially “brokers for the State”, were established to assist individuals with purchasing services (p. 220). Employees from Regional Centers conduct Individual Program Plan (IPP) meetings on a regular basis, which serve to set goals, monitor an individual’s progress, and ensure that services are being delivered as agreed. Following these meetings an IPP report is produced.

Notably, the programs purchased by the Regional Centers must be evidence based. The relevant law elaborates, “[...] the Legislature intends that expenditures on state programs for persons with developmental disabilities shall have measurable and desirable results. The results shall reflect the degree to which persons with developmental disabilities are empowered to make choices and are leading more independent, productive, and normal lives” (Cal. Welfare and Institutions Code § 4750).

The act also provides for vocational programs and other programs aimed at enabling “persons with developmental disabilities to approximate the pattern of everyday living available to people of the same age without disabilities” (Cal. Welfare and Institutions Code § 4691). Programs that can receive funding in service of this goal include “community-based day

programs, which include adult development centers, activity centers, infant day programs, behavior management programs, social recreational programs, and independent living programs” (Cal. Welfare and Institutions Code § 4691). The site of the present study qualifies for funding based on this code.

Under the Lanterman Act, housing is arranged for individuals with developmental disabilities; the housing must be able to accommodate their needs (Cal. Welfare and Institutions Code § 4680). The “Community Care Facilities” are licensed based on their ability to accommodate client need. There are four levels of facilities (1-4). The fourth level (Level 4) has an additional letter designation A-I; as the levels increase additional staffing hours are required (Cal. Code of Regulations Title 17, Division 2, Chapter 3 §56004). As part of the IPP, consumers are also often provided behavioral services. In 2009, a provision was added to the Lanterman Act requiring a behavioral assessment, behavioral intervention plan, and progress measures as part of a “Applied Behavioral Analysis (ABA) services” or “intensive behavioral intervention services” (Cal. Welfare and Institutions Code § 4686.2). The act also required that regional centers “only purchase ABA services or intensive behavioral intervention services that reflect evidence-based practices, promote positive social behaviors, and ameliorate behaviors that interfere with learning and social interactions.” (Cal. Welfare and Institutions Code § 4686.2).

On a federal level, Gresham, Watson, and Skinner (2001) note that the Individuals with Disabilities Education Act (IDEA) was amended in 1997 to require the use of a “functional behavioral assessment” and “positive behavioral supports and interventions” (p. 156). The act effectively prescribes a functional analysis and ABA related approaches for developmental disabilities on a federal level.

Given the result of federal and state legislation a functional analysis and implicitly ABA practices are prescribed. These interventions must be evidence based and establish goals for individuals with developmental disabilities.

Procedures for Identifying, Targeting, and Charting Behaviors

Hurwitz and Minshawi (2012) discuss procedures for a functional analysis. First, a behavior that is problematic is identified; it is important during this stage to determine if the behavior is of “significant enough concern to merit intervention” (p. 92). A behavior is considered significant if it will impact an individual socially, may harm an individual, restricts the places that an individual can go, or interferes with other activities (pp. 92-93).

The next step, according to Hurwitz and Minshawi (2012) is to develop an operational definition. It is important that the operational definition be objective, clear, and complete. Once an operational definition is developed the conditions under which the behavior will be observed and charted must be identified (Hurwitz & Minshawi, 2012). Hurwitz and Minshawi (2012) note that there are several facets of a behavior for which data may be collected; these facets are “frequency count, rate of occurrence, or duration of the behavior” (p. 97). There are several ways of coding these data, including “(1) event coding, (2) interval coding (partial and whole intervals), (3) time sampling, and (4) duration coding” (p. 97). For the purposes of this study (and what is practical in many settings) event recording will be used. In event coding (or “event recording”) each instance of a behavior is charted in an effort to summarize the number of times a behavior occurs. Sheets used in common practice (See Appendix B) also provide information about the date on which the behavior occurred and separate occurrences in the morning from those in the evening.

As a supplement to or in place of this type of charting, Hurwitz and Minshawi (2012) discuss the process of Antecedent-Behavior-Consequence (or simply ABC or A-B-C) analysis.

They explain that following a behavior “the events occurring immediately prior to and following the behavior are recorded” (p. 101). The authors note that the ABC intervention is time consuming and that it may be useful to use this intervention in order to determine the cause of a behavior at which point the ABC charting can be discontinued.

Electronic Charting

Horovitz and Johnny (2012) systematically reviewed the literature on charting types and found a dearth of literature comparing electronic charting to paper charting. Only two notable studies have emerged.

Kahng and Iwata (1998) reviewed 15 software systems for collecting data used in applied behavioral analysis applications. Some systems used desktop computers while others used handheld devices. Notably, Kahng and Iwata’s (1998) review does not examine the efficacy of these programs in assisting with behavior modification. Consumer electronics technology has evolved much since Kahng and Iwata’s (1998) review. New devices and interfaces have emerged, leading to more possibilities for electronic data collection. This is especially true given the ubiquity of smartphones.

Tarbox, Wilke, Findel-Pyles, Bergstrom, and Granpeesheh (2010) compared electronic charting via a handheld computer to traditional paper charting for discrete trial training for children with autism. In discrete trial training, a task is operationalized and the consumer (e.g., child, dependent adult) may receive some assistance (e.g., verbal prompt) to complete the task. The result of the task (e.g., what prompt used) or other outcome is charted for each trial. A reinforcer is often paired with a successful trial. Tarbox et al. (2010) found that paper charting was faster and the both methods were of comparable accuracy.

Ultimately, Tarbox et al. (2010) failed to find any compelling reason to prefer electronic data charting. Notably, the first iPhone was only released in 2007 and widespread consumer

adoption did not occur until much later. Prior to the proliferation of common smartphones, most behavior therapists and like staff were unfamiliar with handheld electronic devices, which were small and cumbersome to use due to their interfaces. Many of these devices utilized styluses instead and did not have touchscreens that could effectively register presses from a finger. In the years since Tarbox et al.'s (2010) study, these devices and public familiarity with them has improved greatly. It is possible that a similar study today would yield different results due to these improvements.

Tarbox et al. (2010) employed electronic data collection for discrete trial training. While discrete trial training may be an important part of behavior modification, this approach is inadequate for behavior management in group homes and at day programs due to the number of clients and frequency of behaviors. For some of the most severe maladaptive behaviors, other charting modalities are more ideal. One approach, event recording, may be the simplest variant. In this approach “target behaviors” are identified and the occurrences of these behaviors are charted. In some variants, intensity, duration, and severity are also charted. Staff may also be asked to chart the antecedents, behavior, consequences, and environments where the behavior occurs; this however requires substantial time. Thus, the differences in modality leave unresolved questions about how Tarbox et al. (2010) generalize to other types of behavior charting.

With modern software it is possible to define software based “buttons” corresponding to target behaviors. The buttons could be programmed to chart the time that the behavior occurs automatically, providing richer data for analysis than is traditionally collected via paper.

Considerations for Statistical Analysis

On behavior data sheets staff typically track the occurrences of behaviors by placing a tally mark in a box that corresponds to the date. It is possible for behaviors to occur infrequently

and for staff to underestimate the occurrences of a behavior. This can occur intentionally (for example, if staff believe that behavior frequency is a marker of their efficacy) or unintentionally (related to forgetfulness, lack of fidelity in coding). The possible result is data that skews towards zero occurrences on a daily basis.

Setting of Present Study

The present study is set in a community based day program in the greater Los Angeles area for adults with developmental disabilities. The local Regional Center has met with consumers and their circle of support prior to their admittance to the program in order to outline goals for the consumer. These goals typically include increases in adaptive functioning, development of work skills, reduction of maladaptive behaviors, and improved socialization skills. This day program provides a work environment for the consumers and includes a kitchen, as well as a store on site that enables consumers to develop and practice their skills. Consumers attend this program with the goal of developing skills that will enable them to socialize with and work with others in the community. The facility accommodates a wide variety of consumers who range from mildly to profoundly developmentally disabled. Facility staff and administrators customize plans to meet each consumer's needs. The facility has staff trained in behavioral interventions on site and contracts with consultants in order to train staff and continually improve care.

APPENDIX B

Informed Consent Form

My name is John Michael Dandurand, M.A. and I'm a fourth year psychology graduate student at Alliant International University. I'm currently performing an experiment to compare different ways of collecting data on maladaptive behaviors. More specifically, I am interesting in comparing traditional paper charting of maladaptive behaviors to electronic charting of maladaptive behaviors.

You are being asked to help research the difference between these two modalities in an effort to produce better outcomes for individuals with developmental disabilities and help find ways to reduce stress on caregivers.

There are two parts to this study. The first part involves completing a questionnaire at different times. The second part involved collecting target behavior data by using an electronic device. If you choose to participate in the first part of the study, you are not in any way obligated to participate in the second part of the study.

Should you choose to participate, you will be asked to complete a questionnaire about your attitudes regarding behavioral interventions and some background information about yourself. After approximately four to eight weeks you will be asked to complete a similar questionnaire again. The second questionnaire is shorter and should take less time than the first questionnaire to complete. The questionnaires should take no longer than 30 minutes each. Coded data (i.e., data that cannot be linked back to you) will be kept indefinitely. Keys to any coded data will be destroyed within five years after the completion of the study. If you agree to participate in the second part of the study, you may be asked to chart using an iPhone instead of on paper for a period of time. The iPhone will contain an electronic version of the behavior data sheet that we currently use to track the occurrence of target behaviors. Just like the paper behavior data sheet, this iPhone app list the client's name or initials, the staff member's name who is charting, and list the client's target behaviors. This data may be collected in the course of your work and should require no additional time to collect on a daily basis.

Currently, for training and quality assurance purposes, [Site Name Redacted] records video of the [Site Name Redacted] facility. Audio is not recorded. This video will be used in this study. Only the research team and I will see these videos. Copies of these videos will be stored on hard drives and kept in a locked box. Copies of these videos will be destroyed within five years after the completion of the study. You have the right to refuse to participate. You also have the right to discontinue participation at any time during the experiment, for any reason, without penalty and to refuse to answer any questions that you don't feel comfortable answering.

Confidentiality of your responses will be maintained. However, it is important to note that the confidentiality of your information cannot be guaranteed if you indicate that you are a threat of harm to yourself or someone else, or if you indicate that you have knowledge of a child, a dependent adult, or older adult (65 years or older) that is being abused or neglected. Additionally, it is possible that the data you provide could be subpoenaed. In these cases, whatever information is necessary to protect the safety of any parties at risk of harm will be disclosed, as mandated by law.

Your name will not be associated with your survey responses unless you agree to participate in the second part of the study. A code will be used to link your responses between surveys, but the code cannot be traced back to you unless you agree to participate in the second part of the study. Non-identifiable raw data will be kept on computers and on servers indefinitely and made freely available to individuals who would like to see the raw data.

There are no direct benefits associated with participation in this study.

You may send an email with the subject “Please Send Me The Charting Study Results” to [Email Redacted] if you would like to see aggregate study results once the data has been analyzed. Individual data will not be released to protect the privacy of all participants.

By signing below you agree that you have received a copy of this consent form. You may contact myself, my faculty sponsor (Nicholas Noviello, Ph.D.), and/or the Alliant International University Institutional Review Board (IRB) at any time if you have additional questions about the rights of study participants or any complaints. The contact information for these entities is listed below.

Researcher	Date	Participant	Date
Contact Information:			
John Michael Dandurand, M.A. Clinical PhD Student at Alliant [Phone Number Redacted] [Email Redacted]	Nicholas Noviello, Ph.D. Dissertation Chair [Email Redacted]	Alliant IRB Office [Email Redacted]	
For Emergencies, Call 9-1-1			

APPENDIX C

Demographic Questionnaire

Demographics

1. With what ethnicity (or ethnicities) do you identify?

_____ White/Caucasian

_____ Black/African-American

_____ Hispanic/Latino

_____ Asian/Pacific Islander

_____ Native American Indian

_____ Other _____

2. How old are you? _____

3. What is your gender? _____

4. What languages do you speak?

_____ English

_____ Spanish

_____ Tagalog

_____ Mandarin

_____ Japanese

_____ Other _____

5. Were you born in the United States? (Circle One) Yes No

Work History

1. How many years (if any) have you worked with clients with intellectual disabilities?

2. How many different settings (e.g., facilities, group homes, day programs) have you worked at? _____

3. Have you worked as a caregiver before? (Circle One) Yes No

APPENDIX D

Additional Study Eligibility Questionnaire

Additional Study Eligibility

We also would like to compare electronic charting to paper charting. This requires that your information be linked from the first part of the study. You can decline to participate in this part of the study and information from the first part of the study will still be valid and useful.

Would you like to participate in a study to compare electronic charting to paper charting?

(Circle One) Yes No

Are you working with a client that has an active behavior intervention plan?

(Circle One) Yes No

If you would like to participate in a study to compare electronic charting to paper charting, please provide your name here below. (Individual responses will be kept private from your employer, but it is necessary to link your responses to the survey data for the second part of the study.)

Name (Print)

Signature

Date

4 Digit Code Used in Survey

APPENDIX E

Attitudes Scales

“Ability to Change” Subscale

1. Many of the individuals I work with have challenging behaviors.
2. Challenging behaviors can be changed.
3. I feel that I can help reduce challenging behaviors.
4. I feel that I receive adequate support to change challenging behaviors.
5. The individuals I work with will never get any “better”.
6. I have witnessed people with challenging behaviors improve.

“Attitudes Towards Behavior Charting” Subscale

7. Behavior charting/paperwork helps me change challenging behaviors.
8. Behavior charting/paperwork allows me to better talk with consultants about behavior.
9. Behavior charting/paperwork about challenging behaviors is unnecessary.
10. I wish I could do my job without completing behavior charting/paperwork.
11. Behavior charting/paperwork takes too much time.
12. I feel that if I complete behavior charting/paperwork inaccurately I may lose my job.
13. I worry about how accurately I complete behavior charting/paperwork.

“Attitudes Towards Electronic Behavior Charting” Subscale

14. I wish there was a way I could chart behaviors more quickly.
15. I am open to using a computer or other electronic device to chart behaviors.
16. I think that individuals with challenging behaviors would improve with other kinds of charting.

Scoring Instructions

Sum all items in each subscale, note that the following items are reverse scored:

“Ability to Change” Subscale

5. The individuals I work with will never get any “better”.

“Attitudes Towards Behavior Charting” Subscale

9. Behavior charting/paperwork about challenging behaviors is unnecessary.
10. I wish I could do my job without completing behavior charting/paperwork.
11. Behavior charting/paperwork takes too much time.
12. I feel that if I complete behavior charting/paperwork inaccurately I may lose my job.

APPENDIX F

Final Attitudes Scales

1. I have witnessed people with challenging behaviors improve
2. I wish I could do my job without completing behavior charting/paperwork.
3. I think that individuals with challenging behaviors would improve with other kinds of charting.
4. I feel that I receive adequate support to change challenging behaviors.
5. Behavior charting/paperwork allows me to better talk with consultants about behavior.
6. Challenging behaviors can be changed.
7. Behavior charting/paperwork takes too much time.
8. I worry about how accurately I complete behavior charting/paperwork.
9. I feel that I can help reduce challenging behaviors.
10. The individuals I work with will never get any “better”.
11. Behavior charting/paperwork about challenging behaviors is unnecessary.