CHOICE-STIMULUS PREFERENCE ASSESSMENT FOR STUDENTS AT-RISK FOR EMOTIONAL DISTURBANCE IN EDUCATIONAL SETTINGS: AN IMPROVEMENT FOR PRACTICE?

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The ability of educators to identify consequences that act as reinforcers may predict the success of behavior change strategies predicated on the use of reinforcement. Although well supported for children with severe disabilities research concerning the effectiveness of choice-stimulus assessment for children with emotional disturbance (ED) remains limited. The current study evaluated the effectiveness of choice-stimulus preference assessment, specifically, multiple-stimulus without replacement (MSWO) procedures, in identifying reinforcers for children with ED using evidence-based math remediation (i.e., cover, copy, and compare [CCC]). The study compared the effects of an MSWO and the vocal nomination of preferences using an alternating treatments single-subject design. The study also assessed the stability of the MSWO and vocal nomination assessments over multiple administrations. Results indicated that the MSWO assessment identified effective reinforcers for students at-risk for ED. The MSWO generated more consistent findings than vocal nomination. In one case, the reinforcers identified by the MSWO assessment evoked more frequent use of CCC than nominated reinforcers. Directions for future research and implications follow a discussion of findings.

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PREFACE

I want to first acknowledge my mother, Phyllis Palmieri, who passed away unexpectedly during the course of this process. All that I accomplish must be credited to her. With sadness, I dedicate this work to her memory.

I also wish to acknowledge my brothers, Morgan and Neil, as well as my grandparents, Margaret and Clayton. This project is in many ways the product of your assistance, wisdom, and—above all—patience. Thank you.

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1.0 INTRODUCTION

The roughly 450,000 individuals, ages 6-21 years, who receive services through the Individuals with Disabilities Education Act (IDEA, 2004) under the category emotional disturbance (ED; US Department of Education, 2008) persistently encounter less success than their peers identified under other disability categories (e.g., learning disability [LD], intellectually disability [ID]; Wagner, Kutash, Duchnowski, Epstein, & Sumi, et al., 2005). Recent emphasis on the use of evidence-based practices (e.g., No Child Left Behind, 2001) among special educators promises to improve outcomes for the disparate, historically underserved (Kauffman & Landrum, 2006) group of students with mental illnesses, chronic behavior problems, and antisocial tendencies that constitute the ED category (Hurley et al., 2010). Nonetheless, the socioeconomic and academic circumstances surrounding students with ED remain grim (Kauffman & Landrum, 2006).

Socioeconomic realities affect students with at-risk for ED long before they have had a chance to encounter failure in the classroom (see Bradley, Doolittle, & Bartolotta, 2008; Harry, Hart, Klinger, & Cramer, 2007; Harry & Kligner, 2006). Nearly a third of students with ED live in poverty and remain far more likely than students with other disabilities to live in environments associated with poor outcomes including: (a) single-parent homes, (b) homes where the head of the household lacks employment or a secondary education, or (c) homes including another family member with a disability (Wagner, Kutash, et al., 2005). Despite these risk factors, students with ED rarely receive early intervention (EI) services (Bradley et al. 2008; Landrum, Tankersley, & Kauffman, 2003). The tentativeness of ED service provision results from the

difficulty in coordinating the multiple service providers involved in EI (Hester, Baltodano, Gable, Tonelson, & Hendrickson, 2003) as well as the confusion—and controversy—surrounding the ED definition (see Bower, 1982; Forness & Kavale, 2000; Kauffman, Mock, & Simpson, 2007). Delayed intervention exacerbates the social and academic problems exhibited by students with ED in educational context (Bradley et al., 2008; Hester et al., 2003 Webster-Stratton, Reid, & Hammond, 2004).

Once in school, students with ED present a range of academic and behavior problems (Landrum et al., 2003). In terms of academic performance, a considerable percentage of students with ED score in the bottom quartile on the Woodcock-Johnson-III (Woodcock, McGrew, & Mather, 2001) tests of reading (61.2%) and math (43%) achievement (Wagner, Kutash, et al., 2005). Students with ED typically have IQs in the range of 90-95 (low-average range; Kauffman & Landrum, 2009). Although generally consistent with the academic performance of students with LD (Sabornie, Evans, & Cullinan, 2006), students with ED receive lower grades than their peers (Wagner et al., 2006). Notwithstanding students with ID, students with ED are more likely to be retained and are less likely to receive a high school diploma or GED equivalent than other students with disabilities (Bradley et al., 2008). The poor academic performance of ED doubtlessly contributes to the school dropout rate of students with ED (44.9%), which far exceeds the dropout rate of other students with and without disabilities (US Department of Education, 2008).

Although the relationship between the poor academic performance and inappropriate behavior exhibited by students with ED remains uncertain (Kellam, Mayer, Rebok, & Hawkins, 1998), intense maladaptive behavior is the most salient characteristic of students with ED (Sabornie et al., 2006). While in school, students with ED engage in fights or exhibit signs of

depression more frequently than their peers (Bradley et al., 2008) and have the highest rate of offenses involving, drugs, alcohol, and weapons (US Department of Education, 2008). Despite the protections available under IDEA, students with ED often remain subject to the same disciplinary measures as their nondisabled peers—the expulsion rate for students with ED is three times higher than for other students (Bradley et al., 2008).

As a consequence of their behaviors, students with ED participate less often in regular education than other students with disabilities (Henderson, Klein, Gonzalez, & Bradley, 2005) and disproportionately receive education services in restrictive settings (US Department of Education, 2008; Whorton, Siders, Fowler, & Naylor, 2000). The reliance on placements such as residential treatment facilities, therapeutic residential schools, and psychiatric facilities (Achilles, McLaughlin, & Croninger, 2007; Hughes & Adera, 2006) potentially contravenes the principles of inclusive education established by the Individuals with Disabilities Education Act (IDEA, 2004). In addition, placement in restrictive settings often results in negative post-school outcomes for students with ED (Bradley et al., 2008; Epstein, Kutash, & Duchnowski, 2005). For example, students with ED have one of the lowest rates of post-secondary school attendance (20.8%) among students with disabilities (Wagner, Newman, et al., 2005).

Educators exacerbate the problems of students with ED through the continued use of ineffective techniques (Bradley et al., 2008). In inclusive settings, students with ED rarely receive tutoring, instruction outside of the classroom, individualized instruction, or small group instruction (Wagner et al., 2006). Regardless of the setting, teachers of students with ED, many of whom obtain employment through emergency licensure and receive little behavior management training (Henderson et al., 2005; Sparks, 2004), seldom use evidence-based practices (Maggin, Wehby, Partin, Robertson, & Oliver, 2011). Based on the perennially dismal

performance of students with ED, educators must consider adopting a more scientific approach to the education of students with ED (Mostert, Kavale, Kauffman, 2008).

Education professionals must adopt evidence-based practices in order to address the problems exhibited by students with ED (Hurley et al., 2010). Rather than resorting to more restrictive settings, practitioners can focus on the use of instructional techniques that promote successful inclusive outcomes for students with ED (Lewis et al., 2004). Evidence-based techniques for students with ED can often be combined into a package of interventions (e.g., positive behavior supports; Lewis, Hudson, Richter, & Johnson, 2004). These practices pertain to the behaviors (see Bullock & Gable, 2006; Clarke, Dunlap, & Stichter, 2002; Lewis et al., 2004; Knitzer, Steinberg, Fleish, 1990) and, more recently, the academic of performance (see Rivera, Al Otaiba, & Koorland, 2006; Templeton, Neel, & Blood, 2008) of students with ED.

Several studies have demonstrated the effectiveness of *self-management programs*, which require students to identify and monitor their own behavior, in reducing problem behaviors and increasing academic performance (e.g., Carr & Punzo, 1993; Dalton, Martella, & Marchand-Martella, 1999). Research offers similar support for *antecedent interventions*, in which teachers manipulate a behavior by altering the environment prior to instruction (Cooper, Heron, & Heward, 2007; Kern, Choutka, & Sokol, 2002). For example, teachers have increased attendance to academic tasks by (a) providing instructions related to appropriate forms of response prior to a lesson (e.g., Gunter, Hummel, & Conroy, 1998), (b) modifying lessons to provide students with multiple opportunities to respond (e.g., Skinner, Turco, Beatty, & Rasavage, 1989), and (c) prefacing directives that generally do not elicit compliance with directives that typically engender compliance (e.g., Mace et al., 1988). *Peer-mediated interventions*, in which peers deliver pre-determined instruction according to a specific protocol (e.g., peer-assisted learning

strategies [PALS]; Fuchs, Fuchs, Mathes, & Simmons, 1997), have also proven effective for students with ED (Ryan, Reid, & Epstein, 2004).

Although novel approaches to educating students with ED continue to emerge, most research focuses on *consequence interventions* (Clarke et al., 2002). Based on the principles of operant conditioning, consequence interventions involve the manipulation of circumstances that follow a behavior as means of influencing the future incidence of the behavior (Cooper et al., 2007). A painful burn, for example, will generally decrease the likelihood that a child will touch a hot stove. In contrast to *punishment*, which decreases behavior, the manipulation of r*einforcers*—consequences that maintain and or increase behavior frequency (Walker, Shea, & Bauer, 2007)—encompasses a range of popular consequence interventions for building appropriate alternate behaviors for students with ED (e.g., LaRue Jr., Weiss, & Ferraioli, 2008; Petscher, Rey, and Bailey, 2009). Common reinforcement procedures include differential reinforcement, noncontingent reinforcement, and token economies (Alberto & Troutman, 2009). Studies have demonstrated the ability of teachers to increase behavior through the contingent dissemination of praise (e.g., Sutherland, Wehby, & Copeland, 2000) or tangible items (e.g., food, toys; Gwinn et al., 2005). The success of reinforcement interventions, however, largely depends on the identification of stimuli that function as reinforcers (Walker et al., 2007).

Prior to using reinforcement in the classroom, practitioners often attempt to isolate potential reinforcers using preference surveys or questionnaires (e.g., Child Reinforcement Survey; Fantuzzo, Rohrbeck, Hightower, & Work, 1991) that require respondents to rank order stimuli (e.g., food, tangible items, or activities) in terms of desirability. The use of surveys reflects the belief that verbal students without severe disabilities have the ability to accurately identify their own reinforcers (Northup, 2000). However, two problems exist. Northup notes that

preference surveys provide limited predictive accuracy. Also, studies of correspondence training, which involve increasing the extent to which statements made by children accurately reflect a past behavior or the intent to perform a behavior in the future (i.e., a promise), suggest that statements made by children may be inconsistent with their behavior (Baer, 1990; Lloyd, 2002).

For practitioners attempting to identify powerful reinforcers for students with ED, choice-stimulus preference assessment may hold promise over typical methods (i.e., surveys). Choice-stimulus preference assessment provides an alternative to surveys as a means of identifying reinforcers (Cannella, O'Reilly, & Lancioni, 2005; Hagopian, Long, & Rush, 2004). In contrast to surveys, choice-stimulus preference assessments directly expose students to stimuli or representations such as note cards, pictures, or verbal prompts and require students to discriminate among the presented stimuli (Hagopian et al., 2004; Northup, Jones, Broussard, & George, 1995). Studies suggest that choice-stimulus preference assessment constitutes an effective method of identifying reinforcers for children with limited verbal ability including those with profound, multiple, and developmental disabilities (e.g., Fisher, Thompson, Piazza, Crosland, & Gotjen, 1997; Graff, Gibson, & Galiatsatos, 2006). The results of studies regarding choice-stimulus preference assessment for students with ED, however, are comparatively mixed. Nonetheless, improving the accuracy of reinforcement identification has the potential to improve the effectiveness of interventions designed to build appropriate behaviors for students with ED.

2.0 LITERATURE REVIEW

Pace, Ivancic, Edwards, Iwata, and Page (1985) developed choice-stimulus preference assessment for students with intellectual disabilities who struggle with verbal expression. Experimental evaluations of the efficacy of choice-stimulus preference assessment involve the use of reinforcer assessments during which researchers observe the effect of presented stimuli on student behavior (Cannella et al., 2005). Research has repeatedly confirmed (see Ivancic, 2000) the predictive validity of choice-stimulus preference assessment, as students provided with a highly preferred stimulus exhibit a higher rate of target behaviors than when provided with a less preferred stimuli. For example, Gwinn et al. (2005) found that, when presented with a choice, a student with ADHD most often selected tasks that resulted in 30 seconds of access to items identified as highly preferred. Common forms of choice-stimulus preference assessment include single-stimulus, paired-stimulus, and multiple stimulus with/without replacement.

2.1 COMMON CHOICE-STIMULUS PREFERENCE ASSESSMENTS

2.1.1 Single-stimulus preference assessment

Demonstrated by Pace et al. (1985), the single-stimulus preference assessment (SS) exposes children to stimuli one at a time. Educators using the SS approach create a hierarchy of student

preferences based on the number of instances in which a student interacts (e.g., consumes, approaches) with a stimulus (Hagopian et al., 2004). Research (e.g., Roscoe, Iwata, & Kahng, 1999; Pace et al., 1985) concerning the efficacy of SS procedures primarily involves individuals with severe intellectual disabilities in hospital or residential settings. In addition, SS procedures require a lengthy administration time of approximately two hours per student (Pace et al., 1985).

2.1.2 Paired-stimulus preference assessment

Fisher et al. (1992) initially described the paired-stimulus preference assessment (PS), or forced-choice approach, as a process whereby educators present children with pairs of stimuli (Hagopian et al., 2004). After presenting students with all possible pairs of stimuli, educators determine preferences based on the frequency of student item selection (Fisher et al., 1992). Successfully employed among a number of populations (e.g., students with intellectual disabilities and autism) and settings (e.g., residential settings, schools; Hagopian et al., 2004), the PS procedures require approximately one hour of administration time (DeLeon & Iwata, 1996).

2.1.3 Multiple-stimulus preference assessment

The multiple-stimulus (MS) and multiple-stimulus without replacement (MSWO) procedures require students to select one of many stimuli presented in an array (Hagopian et al., 2004). In the MS approach described by Windsor, Piche, and Locke (1994), every presentation array includes every stimulus. In contrast, experimenters remove stimuli selected by the subject from subsequent trials during an MSWO procedure (DeLeon & Iwata, 1996). In both cases, practitioners establish preference rankings based on a ratio of stimuli selection to the total

number of trials. Researchers developed MS/MSWO procedures for individuals with profound disabilities in residential settings (e.g., Windsor et al., 1994). Although findings suggest MSWO preference assessment produces a more accurate hierarchy of individual preferences, MS and MSWO procedures represent significantly shorter alternatives to PS or SS forms of preference assessment (Cannella et al., 2005). Averaged over five sessions, the MS and MSWO procedures require approximately 17 and 22 minutes, respectively (DeLeon & Iwata, 1996).

2.2 PURPOSE OF THE REVIEW

The substantial literature base concerning the efficacy of choice-stimulus preference assessment in identifying reinforcers for students with severe disabilities does not directly support the use of choice-stimulus methods for students with ED (Northup et al., 1995). Moreover, the resources requirements and lengthy administration times potentially prohibits the use of choice-stimulus preference assessments in educational settings. Much of the research concerning the use of choice-stimulus preference assessment for students with ED has occurred within clinical settings (e.g., Gwinn et al., 2005). In light of the frequent use of reinforcement based interventions in educational settings, practitioners require an effective means of identifying functional reinforcers. The current review attempts to delineate the characteristics of choice-stimulus preference assessment for students with ED in educational settings. Specific questions include:

1. In what educational contexts have researchers examined choice-stimulus preference assessments for students with ED?
2. How do researchers implement choice-stimulus preference assessments for the identified population?

3. What are the outcomes of choice-preference assessments, and how do they compare to other methods of identifying reinforcers?

2.3 METHODS

A review of the literature was conducted to identify articles attempting to demonstrate the predictive accuracy of choice-stimulus preference assessments among students with ED, defined as students formally identified with ED or emotional and behavioral disorders (EBD), attention deficit disorder (ADD), attention deficit hyperactivity disorder (ADHD), or as being at-risk for ED. Steps in the review included (a) a search of relevant computerized databases, (b) an ancestral search, and (c) a hand search of a the *Journal of Applied Behavior Analysis* (*JABA*). All possible truncations of the following phrases were entered into PsycINFO, PsycARTICLES, and ERIC computer databases: *preference assessment, reinforcer assessment, reinforcer survey* and *emotional disorder, emotional disturbance, behavior disorder, behavior disturbance, emotional-behavioral disorder, ebd,* or *attention deficit disorder, attention deficit hyperactivity disorder, adhd, add,* or *general education*. The search generated 211 peer-reviewed articles. Eligibility for inclusion in the review was determined based on the following criteria:

1. Studies appeared in peer-reviewed journal articles published after the introduction of direct systematic preference assessment in 1985 (Pace et al.).
2. Participants fell within the age range of 6-17 years or identified as attending the first grade at the time of the study. Therefore, studies that focused on toddlers (e.g., Rush, Mortenson & Birch, 2010), young children (e.g., Cote, Thompson, Hanley, &

McKerchar, 2007), or adults (e.g., Grace, Thompson, & Fisher, 1996) were excluded from the review.

3. Studies featured participants identified as having a behavior problem through teacher nomination or formal diagnosis of ED (e.g., see Reddy, De Thomas, Newman, & Chun, 2009; Reddy & Richardson, 2006). In addition, the review included children with ADHD or ADD as these psychological disorders (Fabiano, et al., 2009) frequently coincide with ED (Dietz & Montague, 2006). Studies whose participants exhibited ED potentially in association with a diagnosis of profound disabilities, multiple disabilities, or developmental disabilities including autism and mental retardation (e.g., Kenzer & Bishop, 2011; Mechling & Bishop, 2011) were also excluded.
4. Studies measured the predictive validity of specific forms of stimulus-choice preference assessment (e.g., PS, MSWO) to identify reinforcers using an experimental or quasi-experimental design. Exclusion criteria included (a) the application of a preference assessment without a reinforcement trial (e.g., Cohen-Almeida, Graff, & Ahearn, 2000; Rapp, Rojas, Colby-Dirksen, Swanson, & Marvin, 2010), (b) the use of an unidentified preference assessment (e.g., Kern, Ringdahl, Hilt, & Sterling-Turner, 2001), (c) the use of a forced-choice preference assessments with only one set of stimuli (e.g., Belfiore, Lee, Vargas, & Skinner, 1997; Neef, Shade, & Miller, 1994), (d) the evaluation of choice making procedures as a means of encouraging appropriate behaviors (e.g., Carson & Eckert, 2003; Dunlap et al., 1994), and (e) group designs that did not disaggregate data for students identified with problem behaviors (e.g., Heering & Wilder, 2006).
5. Given the research questions, the studies had to occur in environments in which students with problem behaviors likely receive education services, including public schools,

private schools, residential treatment facilities, or treatment schools (US Department of Education, 2007; Whorton et al., 2000). Excluded studies included those that occurred in outpatient settings (e.g., Gwinn et al., 2005; Haynes, Derby, McLaughlin, & Weber, 2002).

Of the articles identified in the search, seven met the inclusion criteria. An ancestral search of these articles and relevant literature reviews (Cannella, et al., 2005; Hagopian et al., 2004) yielded one additional article. A final step involved a hand search of *JABA*, resulting in no additional articles. The eight identified studies originated from five journals (Berkowitz & Martens, 2001; Daly et al., 2009; Damon, Riley-Tillman, & Fiorello, 2008; Kuhn, Deleon, Terlonge, & Goysovich, 2006; Northup, George, Jones, Broussard, & Vollmer, 1996; Paramore & Higbee, 2005; Resetar & Noell, 2008; Schanding, Tingstrom, & Sterling-Turner, 2009).

2.4 RESULTS

The eight reviewed studies describe (a) the administration settings and participants who received a choice-stimulus preference assessment, (b) the preference assessments employed by the researchers, and (c) the outcomes related to the use of direct preference assessments among students with problem behaviors (see Table 2-1). Notwithstanding differences in method, each of the studies featured single-subject designs in which the researchers identified the preferences of participating students using either choice-stimulus preference assessment or a preference survey. Researchers then evaluated the effect of a preferred stimulus on the students' target behavior (i.e., time on-task).

Table 2-1 Articles Concerning Choice-Stimulus Preference Assessment for Students with ED

Study	Category	*n*	Age	Classification	Design	Choice Format	Findings
Berkowitz & Martens (2001)	Noncomparative	2	11-12	ED	Concurrent operants	Verbal MS	Negative
Daly et al. (2009)	Noncomparative	4	9	ED	Concurrent operants	MSWO	Positive
Damon et al. (2008)	Comparative	4	6-12[a]	At-risk	Reversal , multiple baseline	Teacher survey, pictorial PS	Positive
Kuhn et al. (2006)	Noncomparative	1	10	ED	Concurrent operants	Verbal/tangible PS	Positive
Northup et al. (1996)	Comparative	4	6-9	ADHD	Alternating treatments	Student survey, Verbal/pictorial PS	Positive
Paramore & Higbee (2005)	Noncomparative	3	9-11	ED	Alternating treatments	Tangible MSWO	Positive
Resetar & Noell (2008)	Comparative	4	6-8[b]	At-risk	Alternating treatments	Teacher survey, MSWO	Negative
Schanding et al. (2009)	Comparative	4	6-12	At-risk, ADHD	Alternating treatments	Teacher/student survey, PS	Negative

Note. MS = multiple-stimulus with replacement; EBD =emotional behavioral disorder; MSWO = multiple-stimulus without replacement; PS = paired-stimulus; ADHD = attention deficit hyperactivity disorder.
[a] Age of participants is approximate; study involved students in grades 1-5. [b] Age of participants is approximate; study involved students in grades 1-2.

The current review divided studies into two categories: noncomparative and comparative. Articles in the noncomparative category (Berkowitz & Martens, 2001; Daly et al., 2009; Kuhn et al., 2006; Paramore & Higbee, 2005) attempted to demonstrate the effectiveness of choice-stimulus preference assessment among students with ED. The articles with comparative outcomes (Damon et al., 2008; Northup et al., 1996; Resetar & Noell, 2008; Schanding et al., 2009), in addition to demonstrating the efficacy of choice-stimulus preference assessment, evaluated the relative performance of different preference assessments. Specifically, the studies compared the results of choice-stimulus preference assessment with alternate assessments completed by teachers (Damon et al., 2008; Resetar & Noell, 2008), the participating students (Northup et al., 1996), or both students and teachers (Schanding et al., 2009).

2.4.1 Participants and Settings

All studies evaluated the efficacy of choice-stimulus preference assessment among young children (6-12) using no more than four participants. Two studies (Kuhn et al., 2006; Northup et al., 1996) involved children with ED in restrictive educational settings. Northup et al. (1996) conducted the first study of choice-stimulus preference assessment that featured children with ADHD outside of a purely clinical setting. In a similar study, Kuhn et al. (2006) examined the effectiveness of preference assessments for a student with severe EBD (self-injurious behavior) in a residential facility. Studies conducted in general education settings involved children with documented EBD (Berkowitz & Martens, 2001; Daly et al., 2009; Paramore & Higbee, 2005) or at-risk students (Damon et al., 2008; Resetar & Noell, 2008; Schanding et al., 2009) exhibiting relatively mild noncompliant behaviors (e.g., failure to complete work, inattentiveness, itinerancy).

2.4.2 Preference Assessment Implementation

Researchers in noncomparative studies narrowed the range of stimuli featured in the choice-stimulus preference assessment to items considered appropriate for a school context (Berkowitz & Martens, 2001; Daly et al., 2008) or through preassessment interviews (Kuhn et al., 2006; Paramore & Higbee, 2005). As in earlier research involving nonverbal students, Kuhn et al. (2006) solicited possible preferences from the caretakers of the students using the Reinforcer Assessment for Individuals with Severe Disabilities (RAISD; Fisher, Piazza, Bowman, & Amari, 1996)—a formalized interview that addresses a range of stimulus classes (e.g., activities, tangibles). In light of the verbal skills of the participants, Paramore and Higbee (2005) identified preferred edibles through a less formal interview process that included responses from participating students and caretakers.

Comparative studies featured surveys that identified an initial set of preferred stimuli and evaluated the accuracy of the preference hierarchies created by choice-stimulus preference assessments. Resetar and Noell (2008) required teachers to assign ranks based on perceptions of student preferences to 20 edible and tangible stimuli using an informal survey. The remaining comparative studies (Damon et al., 2008; Northup et al., 1996; Schanding et al., 2009) featured variations of the Child Reinforcement Survey (CRS; Fantuzzo et al., 1991), a standard preference survey. As originally designed, the CRS identifies preferred and nonpreferred stimuli without establishing a hierarchy of respondent preferences. Respondents rate (e.g., respondent likes item *a lot, somewhat, not at all)* stimuli that commonly appear in schools (e.g., chocolate). Each stimulus corresponds to a general stimulus category (e.g., edibles, tangibles). Northup and colleagues (1996) modified the CRS by assigning an ordinal rank to each rating and converting the sum of the ranks for each category into a percentage score. The scoring method identified

several categories as highly preferred, producing an indistinct hierarchy of preferences in which no single stimulus category emerged as the optimal preference. Schanding et al. (2009) created a more definitive preference hierarchy by requiring teachers and students to rank their top choices using the Ranked Reinforcer Survey (RRS), a modified form of the CRS. Damon et al. (2008) compared a ranked list of teacher-nominated preferences from a single stimulus category (i.e., activities) to the results of a PS preference assessment. The wider range of stimuli presented in the PS assessment was initially identified using a CRS.

Each of the studies featured variations of PS and MS/MSWO preference assessment (Cannella et al., 2005; Hagopian et al., 2004). Studies that included the PS procedure offered students a chance to select stimuli based on verbal (Kuhn et al., 2006; Northup et al., 1996), tangible (Kuhn et al., 2006), pictorial (Damon et al., 2008; Northup et al., 1996), or written (Schanding et al., 2009) prompts. The verbal PS procedure created by Northup et al. (1996) assessed preference for classes of stimuli (e.g., edibles, attention) derived from the CRS rather than for specific stimuli, and consequently required three minutes to administer. Kuhn et al. (2006) presented participants with individual stimuli (e.g., comic book, tickling) due to concerns regarding the potential of preferences for specific stimuli within a class to skew the perception of an entire class.

Researchers using tangible, pictorial, and written PS procedures employed similar methods as Fisher et al. (1992) with notable differences including the use of concurrent verbal prompts. Damon et al. (2008) presented subjects with pictures designed to depict individual stimuli. Although the authors did not report the duration of the assessment administration, they described the process as "time and labor intensive" (p. 51). The pictorial assessment employed by Northup et al. (1996), which presented students with coupons representing classes of stimuli,

required approximately five minutes to administer. Similarly, the written assessment used by Schanding et al. (2009) did not exceed five minutes.

Researchers who administered the MS/MSWO allowed children to make selections from an array of tangible objects (Paramore & Higbee, 2005; Resetar & Noell, 2008) or written prompts representing tangible stimuli and activities (Daly et al., 2009, Berkowitz & Martens, 2001). MSWO sessions, though similar to work initially conducted by Deleon and Iwata (1996), decreased the number of assessment sessions from five to three and reduced the number of items in the array as a means of increasing the efficiency of the assessment (Carr, Nicolson, & Higbee, 2000). Neither Daly et al. (2009) nor Resetar and Noell (2008) reported the length of each session. However, Paramore and Higbee (2005) reported the MSWO procedure required 10 minutes of administration time. The MS procedure performed by Berkowitz and Martens (2001) differed from previous procedures (e.g., Windsor et al., 1994) in several respects. Rather than requiring participants to select items from an array, students in one 20-minute assessment session arranged note cards featuring 10 potential reinforcers in order of preference. In addition, the researchers permitted students to select the academic assignments (i.e., reading, math, or arithmetic) required to attain the stimuli.

2.4.3 Outcomes of Noncomparative Studies

Choice-stimulus preference assessments identified functional reinforcers capable of increasing student task performance in the majority of noncomparative studies (Daly et al., 2009; Kuhn et al., 2006; Paramore & Higbee, 2005). Paramore and Higbee (2005) found that stimuli identified as preferred resulted in an increase of on-task behavior over a large number of treatment sessions (n>20). Initially the response level and trend increased sharply in comparison to baseline

regardless of the preference rank of the reinforcer. However, a greater differentiation in response emerged over time, with the high-preference items producing the highest percentage of intervals on-task. Kuhn et al. (2006) observed that the participant, when reinforced with a stimulus identified using tangible PS, exhibited a higher rate of worksheet completion relative to other forms of reinforcer identification (i.e., verbal PS). Daly et al. (2009) observed similar findings, though the students received a potentially confounding form of reinforcement (e.g., escape from class) upon satisfying the criteria necessary to receive the proffered reinforcement (i.e., completion of math problems).

In contrast, Berkowitz and Martens (2001) identified a small average Spearman rank order correlation (.33) between the results of the MS assessment and a reinforcement assessment providing limited support for choice-stimulus preference assessment. Furthermore, students proved less responsive to highly preferred stimuli as the demands of the task (i.e., number of required math problems) increased (Berkowitz & Martens). Although results presented by Berkowitz and Martens may undermine the supposed predictive ability of choice-stimulus assessment, multiple factors (i.e., unusual preference assessment, lack of baseline, limited number of trials, etc.) attenuate the findings.

2.4.4 Outcomes of Comparative Studies

Based on the increases observed in student response, choice-stimulus preference assessments identified functional reinforcers in each of the comparative studies. Nonetheless, studies that compared reinforcers identified by teachers to choice-stimulus preference assessment (Damon et al., 2008; Resetar & Noell, 2008) yielded mixed results. Damon et al. (2008) found that reinforcers selected through PS assessment produced the highest levels of response in a reversal

design measuring the rate of math fact completion and a multiple-baseline design measuring on-task behavior (e.g., engagement with instructor or materials) in the classroom. Resetar and Noell (2008) observed that the number of math problems completed by students under reinforcement conditions surpassed average baseline problem completion (13.25) and performance under a no reward condition (13), suggesting that the preference assessments identified functional reinforcers. However, the students exhibited similar rates of response under both reinforcer conditions. The reinforcer assessment revealed minimal average differences between the number of items students completed when students received reinforcers identified by MSWO assessment (24.15) and the teacher survey (21.22).

Additional studies (Northup et al., 1996; Schanding et al., 2009) revealed limited differences in the predictive accuracy of choice-stimulus preference assessments and surveys completed by students. Northup et al. (1996) found that both the CRS and choice-stimulus preference assessments identified the reinforcer associated with the highest rates of responding on a contrived digit coding task (e.g., matching letters with numbers) for the majority of participants. However, the CRS also identified several items as highly preferred that failed to increase the response rate of participants. Identification accuracy associated with pictorial PS assessment (80%) and verbal PS assessment (70%) exceeded the accuracy of the CRS (55%). A second administration of all of the preference assessments following the reinforcer assessment found the reliability of the pictorial PS assessment (80%) to be greater than either the verbal PS assessment (60%) or the CRS (65%). Although reinforcers identified by the PS preference assessment elicited a slightly higher response on a digit coding task for three of the four participants, Schanding et al. (2009) reported similar increases in the frequency of task completion in response to reinforcers identified by the RRS.

2.5 DISCUSSION

The current review evaluated the research concerning use of choice-stimulus preference assessments for students with ED in educational settings. Specific questions addressed (a) the instructional context, (b) implementation, and (c) efficacy of researcher administered choice-stimulus preference assessments for students with ED. Although some studies featured specialized and restrictive facilities, much of the research occurred in general education settings. Methods employed in the identified studies, though generally consistent, provide little insight into the issues associated with stimulus choice-preference assessment. Five of the studies reported presenting children with verbal or pictorial representations of stimuli during the assessment. With few exceptions, researchers employed uniform stimuli and did not allow participants to interact with selections. The administration of the choice-stimulus assessments generally occurred prior to the experimental reinforcer evaluation and did not permit an evaluation of the stability of preference assessment. Study outcomes suggest that choice-stimulus preference assessment identified stimuli that increased student task performance. However, differences in the predictive value among choice-stimulus preference assessments and surveys remain unclear.

2.5.1 Participants and Setting

The settings featured in the studies depict the full range of locations in which young children with ED (ages 6-12) receive education services. However, the majority of the studies (Berkowitz & Martens, 2001; Daly et al., 2009; Kuhn et al., 2006; Northup et al., 1996; Resetar & Noell, 2008; Schanding et al., 2009) administered experimental procedures outside of the students' typical classroom (e.g., empty classroom, isolated treatment room). Given the role of classroom stimuli in maintaining inappropriate behavior, settings removed from the classroom may not represent the ideal milieu for establishing the effectiveness of reinforcers. Alberto and Troutman (2009) noted that stimuli administered in contrived settings have a different effect on student behaviors than stimuli administered in the classroom. Furthermore, the presence of experimenters and trained researchers, rather than classroom teachers, may have served as a confounding reinforcer of student behavior (Resetar & Noell, 2008). Although the findings of Damon et al. (2008) suggest that reinforcement assessments conducted in contrived and classroom settings yield similar results, the majority of the literature provides little insight into whether reinforcers identified through choice-stimulus preference assessment can function in an authentic context (i.e., classroom, peers, teachers, etc.).

2.5.2 Implementation

Several studies implemented choice-stimulus preference assessment using methods established among other populations (e.g., Cannella et al., 2005; Hagopian et al., 2004), with exceptions related to the characteristics of students with ED and general education settings. Past researchers evaluating students with severe disabilities typically gathered information for the choice-stimulus

assessment from student caregivers and presented students with tangible stimuli (e.g., Piazza, Fisher, Hagopian, Bowman, & Toole, 1996). Although several studies in the current review continued to use teacher input and tangible stimuli during choice stimulus preference assessments (e.g., Kuhn et al., 2006), the verbal skills of students with ED enabled researchers to augment caretaker information with student input and present verbal (e.g., questions, note cards) representations of stimuli (e.g., Northup et al., 1996).

Previous studies concerning students with severe disabilities in residential settings offered participants a wide range of reinforcers (e.g., Pace et al., 1985). A change from clinical to educational settings required researchers to limit the options available to students as a response to the requests of teachers. Several studies (Berkowitz & Martens, 2001; Daly et al., 2009) included items in the assessment based on the established preferences of the teachers. Thus, researchers excluded stimuli (e.g., escape, edibles) from consideration based on objections from teachers (Berkowitz & Martens, 2001). The limitations placed on the stimuli presented in the choice-stimulus preference assessment potentially precluded highly preferred items from subsequent reinforcer assessments, potentially explaining the lack of response differentiation observed in some studies (e.g. Resetar & Noell, 2008).

2.5.3 Outcomes

Educators often use reinforcement strategies to encourage students with ED to complete daunting or otherwise unappealing academic assignments (Alberto & Troutman, 2009). The negative relationship between reinforcer effectiveness and response effort (i.e., task difficulty) observed in research concerning reinforcement (e.g., Neef et al., 1994) suggests that students may require high-quality reinforcement in order to complete challenging assignments. Nonetheless, the

majority of the reviewed studies (Berkowitz & Martens, 2001; Daly et al., 2009; Kuhn et al., 2006, Northup et al., 1996; Resetar & Noell, 2008; Schanding et al., 2009) appraised the predictive validity of the preference assessments using contrived activities (e.g., basal math problems, digit coding) unrelated to the ED of participants. Studies assessing the efficacy of reinforcers through the use of facile tasks provide limited insight into the capacity of choice-stimulus preference assessment to identify highly preferred stimuli in educational settings. Although Northup et al. (1996) suggest that the findings of choice-stimulus preference assessments appear to be more consistent than those of preference surveys, the available studies do not permit conclusions regarding stability.

Compared to surveys, findings of the current studies do not suggest that choice-stimulus preference assessments constitute a superior method of establishing preference hierarchies. However, the surveys featured in the studies potentially influenced the results. Northup and colleagues' (1996) findings, though supportive of choice-stimulus preference assessment, may have resulted from a comparison of dissimilar procedures; the CRS—unlike choice-stimulus preference assessment—does not establish a hierarchy of preferences. Two studies in which preference surveys required respondents to assign ranks to stimuli (Resetar & Noell, 2008; Schanding et al., 2009) did not find reinforcers identified through choice-stimulus preference assessment more effective. Although Damon et al. (2008) suggest that reinforcers identified through choice-stimulus preference assessment yielded higher rates of student response compared to teacher rankings, study procedures permitted students to identify preferences from a much larger range of stimuli than teachers. Teachers limited to nominating preferred activities may have been prevented from selecting stimuli from alternate categories (e.g., edibles) that

could have elicited higher rates of response. The results may also indicate that student input improves the identification of reinforcers regardless of how researchers obtain the information.

2.5.4 Implications for Practice

The studies identified in this review—though they cast doubt on the efficacy of conducting choice-preference assessment for children with ED—hold some value for practitioners. Choice-stimulus preference assessment successfully identifies reinforcers, which may prove useful to teachers who wish to provide rewards but remain largely unaware of their students' preferences (Fantuzzo et al., 1991). As preferences vary among individual students, educators can conduct a form of assessment to increase the efficacy of reinforcement strategies (Alberto & Troutman, 2009). Findings also demonstrate that response to reinforcement varies based on the level of student preference, underscoring the additional value of ranking, rather than merely identifying, preferences.

Nonetheless, the available literature provides only partial insight into the practical application of choice-stimulus preference assessment. Choice-stimulus preference assessments may be administered quickly and in a manner similar to the individualized assessments commonly used in special education (e.g., Floyd, Phaneuf, & Wilcznski, 2005). Regardless, the reviewed research provides little information concerning the skills required to administer choice-stimulus preference assessments. The experimenters in Damon et al. (2008) received consultation training through a psychology program and claimed at least 10 years of classroom experience. However, the remaining studies provided limited information regarding the training or experience received by administrators of the assessments. Consequently, certain preference surveys (i.e., CRS) appear to provide educators with an equally effective form of reinforcer

identification that presents fewer challenges in terms of time or resources (Damon et al.; Volz & Cook, 2009).

Identifying a specific reinforcer prior to instruction may assume a great degree of importance when teaching students with severe disabilities or students that require immediate access to reinforcement. However, the current literature base does not address the larger question of whether choice-stimulus assessment constitutes a necessary step in changing the behavior of students with ED. For example, the effective use of interventions such as consequence choice (e.g., Carr & Carlson, 1993) or token economies (e.g., LePage et al., 2003) may preclude the predictive function of choice-stimulus preference assessments (Cooper et al., 2007). Although identifying effective stimuli remains integral to reinforcement interventions, teachers may find it simpler to identify student preferences using surveys rather than choice-stimulus assessment.

2.5.5 Directions for Future Research

Research should continue to compare choice-stimulus preference assessment to preference surveys. The literature has yet to conclusively demonstrate advantages in reinforcement identification through the use of choice-stimulus preference assessment. However, the majority of comparative studies featured formal preference surveys (i.e., CRS) that may not be available for use in all settings. Additional research should compare the results of choice-stimulus preference assessment to simpler alternatives, such as ranked student interviews, that practitioners may be more likely to employ. Partially addressed by Northup et al. (1996), an evaluation of the relative stability of preferences identified through choice-stimulus assessments and surveys would also contribute to the identification of reinforcers for students with ED.

In terms of population, the focus of current research should encompass the use of choice-stimulus assessments for adolescents with ED. A more specific emphasis on behaviors encountered by practitioners would greatly enhance the utility of choice-stimulus research. Also, research can help determine the relationship between the range of conditions associated with ED (e.g., anxiety, depression) and the accuracy of specific preference assessment formats (Kaufman & Landrum, 2009; Reddy & Richardson, 2006).

Unlike previous work concerning individuals with severe disabilities, the current body of literature incorporated verbal prompts, note cards, and other forms of verbal stimuli into choice-stimulus procedures. Although partially examined (Kuhn et al., 2006; Northup et al., 1996), the impact of incorporating verbal stimuli into choice-stimulus assessment remains unclear. An examination of the impact of tangible or verbal prompts on the accuracy of choice-stimulus preference assessment should accompany future research.

The emphasis on irrelevant tasks in the literature threatens to trivialize choice-stimulus assessment. Future comparative study may determine if stimuli identified as highly preferred through choice-stimulus preference assessments elicit higher rates of response from students required to complete authentic academic activities. Similarly, research should attempt to demonstrate that reinforcers identified through choice-stimulus preference assessment compete successfully with the classroom stimuli that frequently maintain inappropriate behavior.

2.6 CONCLUSIONS AND RESEARCH QUESTIONS

An effective method for identifying reinforcement for individuals with severe disabilities (Hagopian et al., 2004), choice-stimulus preference assessment does not appear to improve the

use of reinforcers among children with ED over vocal indications of preference. Further research is required, however, as the issues of studies identified in the current review obfuscate conclusions regarding the efficacy of choice-stimulus preference assessment. At minimum, choice-stimulus preference assessment appears to represent an effective method of identifying reinforcers. Given the frequent use of reinforcement based interventions, practitioners require an accurate means of identifying reinforcers capable of building academic behaviors. The current study attempts to evaluate the effectiveness of choice-stimulus preference assessment in identifying reinforcers for children at-risk for ED using an evidence-based form of math remediation (i.e., cover, copy, and compare [CCC]; see McLaughlin & Skinner, 1996; Skinner, McLaughlin, & Logan, 1997). **Although students will likely benefit from the use of evidence-based instruction, the goal of the current study is to determine the relative effectiveness of two forms of reinforcer identification (i.e., MSWO, student ranking).** Specific questions include:

1. How does the use of reinforcers identified through either through MSWO or vocal student ranking impact the use of steps in an academic task (i.e., CCC) by students with ED?
2. What is the effect of reinforcement on the use of CCC by students with ED?
3. What is the relative stability of the results of MSWO and vocal student rankings?

3.0 METHODS

3.1 PARTICIPANTS AND SETTINGS

Participants were recruited from an urban, northeastern charter school (see Appendix A for district approval letter). The school maintained a comprehensive school-wide behavior support system that awarded privileges (e.g., field trips) to students who exhibited appropriate behavior. In addition, students with- or at-risk for ED received additional support including: enrollment in individualized token economies, periodic activity breaks removed from the general classroom (i.e., sensory breaks), and 1-to-1 academic remediation. An emotional support teacher administered materials related to the token economy, sensory breaks, and remediation within a small (10 x 15) resource room that contained a large table, two desks, and various equipment (e.g., jump ropes) used for sensory breaks. Assessments (e.g., screening, preference surveys), training sessions, and experimental sessions occurred in the resource room in which the students typically received services for remediation and emotional support. Participating students did not receive access to reinforcers featured in the experiment prior to-or immediately following each experimental session. All experimental procedures occurred during the participants' regularly scheduled support periods. Preference assessment sessions remained private. Experimental sessions were more typical, however, in that teachers and peers accessed the room. However, no more than two additional teachers and students were present at any time during the experiment.

The principal investigator, a doctoral student who specialized in the education of students with ED, conducted all procedures using a one-to-one format.

A special educator with 4 years of experience and a specialization in ED agreed to participate in the study. The participating teacher disseminated consent letters (see Appendices B, C, and D) describing the study to parents of children who (a) were identified as having an ED diagnosis or behavioral modifications on their individualized education plans (IEP) and (b) experienced difficulty with basic math facts (e.g., addition, subtraction, single-digit multiplication). Given the academic profiles of students with LD and ED (Sabornie et al., 2006), students with comorbid diagnoses of LD and ED were included. However, students with additional diagnoses of intellectual disability (Daily, Ardinger, & Holmes, 2000) or other developmental disorder (e.g., autism) were excluded. Informed consent was obtained in accordance with IRB protocols. Following the receipt of consent from the school, letters of consent were disseminated to teachers. Student assent was obtained immediately prior to screening.

During screening, the multiplication skill of students was assessed according to procedures described by Shapiro (2011). The instructional level of students (e.g., frustration, instructional, mastery) was determined using the mean digits correct per minute (DCPM; i.e., separate digits below the answer line) provided on three separate single-skill fact probes. Probes were selected with the assistance of the participating teacher. Students completed either addition or multiplication probes (digits 2-9) based on their IEP goals and the expectations of their current mathematics class. Performance criteria were based on the work of Deno and Mirkin (1977, as cited in Shapiro). Students performing above the instructional level (i.e., students who did not need remediation) were excluded from the study (see Appendix E for placement criteria). Five

participants were identified following the initial consent process. Of these, one student was unable to complete training procedures (i.e., could not correctly recite the math problem) and was exited from the study. An additional student (Ned) could not complete the experiment following his suspension prior to the completion of the experiment. The suspended student's truncated data was insufficient for visual analysis. Ned also did not complete follow-up preference assessments or the social validity survey. Ned's demographic data, variable reinforcement schedule, initial preference assessment results, reinforcer assessment performance data, and math fact performance appear in Appendices F-M. Two of the students (Chris and Stan) received medication for ADHD (Strattera) prior to the beginning of each school day. The diagnoses, behavioral issues, demographic data, and proficiency level of the three students who participated in the study appear in Table 3-1.

Table 3-1 Participant Demographic Information

Student	Skill (Proficiency Level)	Age (yrs.)	Grade	Gender	Race	Primary Disability	Secondary Disability	Reason for Emotional Support Services	Support
Chris	Addition (F)	8	2nd	M	AA	OHI	N	ODD, disruptive behavior, noncompliance, physical aggression directed toward peers and staff, possible PTSD	Sensory breaks, token economy, pull-out academic support
Frank	Multiplication (F)	10	3rd	M	AA	OHI (ADHD)	N	Depression, suicide attempts, refusal to complete tasks, verbal aggression toward peers	Token economy, wrap-around services (home), pull-out academic support
Stan	Addition (I)	9	3rd	M	C	SLD	OHI (ADHD)	Physical aggression, problems with peers	Token economy, pull-out academic support

Note. F = frustration; I = instructional; N = none; M = male; AA = African-American; C = Caucasian; OHI = other health impairment; ADHD = attention-deficit disorder; SLD = specific learning disability; ODD = oppositional defiant disorder; PTSD = post-traumatic stress disorder. Proficiency refers to the performance of participants on math-fact screening.

3.2 MATERIALS

3.2.1 Math probes

A website (Softschools.com, 2012) was used to randomly generate single-skill math-fact (e.g., single-digit multiplication, single-digit addition) assessment materials consisting of 35 problems (see Appendix N for an example). During the initial screening assessment and subsequent assessment sessions, students were provided with more problems than could be completed in the assessment period. Problems featured on the probes corresponded with the area of focus recommended by the participating instructor (see Table 3-1). Thus, students working on addition were not required to complete multiplication probes. In accordance with Shapiro (2011), students received 5 minutes to complete multiplication probes and 2 minutes to complete addition probes.

3.2.2 Cover, copy, and compare training sheets

CCC training materials were generated using Microsoft Excel. Each CCC sheet featured problems with the correct answers, and unanswered versions of the problems in order to facilitate CCC. Additional space was provided for the execution of correction procedures (see Appendix O for an example).

3.2.3 Ranked Reinforcement Survey

Created by Schanding et al. (2009), the Ranked Reinforcement Survey (RRS) features 36 potential reinforcers randomly divided into nine groups. As originally conceived (Schanding et al., 2009), the RRS requires students to rank stimuli rather than identify preferred or nonpreferred items. Each of the stimuli contained on the RRS represent one of three categories of reinforcers (i.e., tangibles, activities, social rewards) previously featured on the Child Reinforcement Survey (Fantuzzo, et al., 1991). Each category corresponds to a subscale featuring 9 items. Internal consistency coefficients suggest moderate reliability for each category of the original CRS: edibles (r = .61), tangibles (r = .46), activities (r = .47), and social rewards (r = .75; Fantuzzo et al., 1991).

In the current study, the subscales involving tangibles (e.g., pencils) and social reinforcers (e.g., hugs) were omitted. Edibles that could not feasibly be administered in the classroom environment (e.g., ice cream) were also omitted. In addition, activities that were not appropriate given the context of the study (e.g., seeing a movie) were not included. Consequently, the current RRS contains 8 items from the edible subscale and 6 items from the activity subscale. The participating teacher approved the items offered on the RRS prior to administration.

Altering the subscales compromised the previously reported reliability of the item categories featured on the RRS. Nonetheless, the RRS provided a systematic and replicable means of allowing a student to identify preferred stimuli. Moreover, the practice of eliminating subscales and individual subscale items remained consistent with previous studies (Berkowitz & Martens, 2001; Schanding et al. 2009). Administration of the RRS was conducted in accordance with procedures outlined by Schanding et al (see Appendix P for an example).

3.2.4 Multiple-stimulus without replacement preference assessment

Originally demonstrated by DeLeon and Iwata (1996), the MSWO entailed (1) presenting students with a randomized array of stimuli, (2) allowing students to select a stimulus, (3) removing the stimulus from the array, and (4) prompting the student to select another stimulus. A preference ranking based on a ratio of stimuli selection to the total number of trials was calculated following the session. Sufficient amounts of the stimuli needed to conduct the MSWO were obtained prior to the assessment session.

3.2.5 Video Recorder

The principal investigator recorded all preference assessment and CCC sessions using a tripod-mounted digital video recording device. Session times as well as measures of interobserver agreement and treatment fidelity were obtained from the recorded footage.

3.3 EXPERIMENTAL DESIGN

Prior to the experimental condition, a baseline condition, in which the student used CCC without access to reinforcement, was maintained in order to determine a reinforcement schedule, or the number of responses required before students earned reinforcement (Cooper et al., 2007). Thereafter, the effect of contingent stimuli on the number of correction procedures and initial problems correct was observed using an alternating treatments design (Johnston & Pennypacker, 2009). Experimental conditions included (a) contingent presentation of the stimulus that

students nominated as their top preference, and (b) contingent presentation of stimuli identified through MSWO preference assessment. A simultaneous control condition in which contingent stimuli were not available was also observed. Control and experimental conditions were counterbalanced to control for sequence effects (e.g., ABCBCACAB; Kennedy, 2005).

Primary analysis relied on the methods of single-subject research, in which a visual analysis establishes a functional relation between the independent variable (i.e., reinforcers identified through either RRS or MSWO) and the dependent variables (i.e., use of CCC). This relation is established through the demonstration that improvements in the dependent variable are related to the implementation of the independent variable. The repeated alteration of experimental conditions in an alternating treatments single-subject design allows for multiple opportunities for replication.

3.4 DEPENDENT VARIABLES

3.4.1 Use of CCC per session

The principal investigator documented the use of CCC during each session. The observation checklist featured the following steps of CCC: (1) student observes a model problem (i.e., problem with correct answer), (2) student repeats problem aloud, (3) student covers model problem, (4) student attempts to complete an unanswered form of the model, (5) student compares his answer to the model, and (6) student repeats the process if his or her attempt does not match the model. An instance of CCC was defined as the observed application of CCC steps that resulted in a correct answer to a multiplication fact.

3.4.2 Digits correct and digits incorrect per minute

Though not a dependent measure, the accuracy of student responses was determined through measures of problems correct and problems incorrect on probes used during screening. The probes were administered every fifth session. A measure of DCPM and digits incorrect per minute (DICPM) served to determine fluency. A digit was considered correct if the correct numeral appeared in the correct column. Digit reversals were also considered correct.

3.4.3 Assessment Stability

Preference stability of the ratio data generated by the MSWO was determined using the Pearson product-moment correlation. Spearman's rho, a nonparametric method for examining relationships between ordinal ranking variables, was used to assess the stability of the vocal nomination assessment (Gravetter & Wallnau, 2009). Exact agreement between the initial and final administrations of both assessments was also assessed. Agreement was defined as instances in which both assessments assigned the same rank to a stimulus. Percentage agreement was determined by dividing the number of agreements by the number of disagreement plus agreements and multiplying by 100.

3.5 INDEPENDENT VARIABLES

The alternating treatments design facilitated an analysis of the effect of two independent variables on student responding (i.e., use of CCC, number of correction procedures per session).

Specifically, the study examined the impact of (a) contingent presentation of a stimulus identified through student nomination, and (b) contingent presentation of a stimulus identified through MSWO preference assessment. A condition without the contingent presentation of stimuli was also maintained.

3.6 PROCEDURES

3.6.1 Screening

Following the initial consent of participants, the principal investigator scheduled a screening visit at the child's school. During this visit, the principal investigator collected a copy of the child's Individualized Education Plan (IEP) and administered a math assessment to the child to determine whether the child qualified for the study (i.e., instructional level or below). The students received probes featuring single-digit addition (Chris and Stan) or multiplication (Frank) math facts. Each student completed three probes over three consecutive days of assessment (see Appendix E for placement criteria). The results were used to determine the instructional level of and eligibility of students. In addition, the principal investigator obtained information regarding the behavior of the participating students, medication used by the student, the child's engagement with current instruction, and effective instructional strategies for the child.

3.6.2 Ranked Reinforcement Survey

After the determination of eligibility, the RRS was administered to qualifying students in an interview format. The principal investigator read the list of 14 potential reinforcers to students, placed the stimulus list in front of the student, listed stimuli from each of the groupings, and recorded the student's responses. Following the initial identification of preferred stimuli, students established a hierarchy of preferences for the remaining seven items through vocal nomination and the MSWO preference assessment.

3.6.3 Vocal Nomination

After the student reviewed the stimuli, the principal investigator asked the student to rank the seven items identified through the RRS in terms of preference. The principal investigator then recorded the student's rankings. Participating students received the top ranked stimulus under the vocal nomination condition. Students who identified identical top preference across the vocal nomination and MSWO assessments (i.e., Ned) received the item with second highest preference rank (i.e., pretzels) during vocal nomination sessions.

3.6.4 MSWO Assessment

Following the RRS, the brief MSWO preference assessment was administered separately in accordance with the work of Paramore and Higbee (2005). An array consisting of stimuli selected from the RRS (n = 7) was presented to students. To prevent sequencing effects, the principle investigator randomized the presentation of the array prior to each MSWO session.

Students selected stimuli either verbally or nonverbally (e.g., pointing) and were allowed to interact with the selection for 30 seconds (e.g. Kuhn, DeLeon, Terlonge, & Goysovich, 2006). Activities were presented to the student by allowing the student to interact with related materials (e.g., tablet computer, television remote controller, art supplies). Stimuli that could not be represented with tangible objects (i.e., helping the teacher) were presented pictorially. The principal investigator did not return selected stimuli to the array, and the remaining items were rearranged. After four items were selected, the process was repeated two more times, for a total of three complete MSWO trials during the session.

As in DeLeon and Iwata (1996), a preference rank was created based on a ratio of stimuli selection to the total number of trials. Specifically, the principal investigator converted the ratio of the number of times an item was selected from an array in which the item was presented into a percentage. An item selected first during the initial array and second from the following two presentations, for example, resulted in a ratio of three selections to five total arrays—a preference score of 60%. For Chris, Frank and Stan, the stimulus with the highest rank was used in the MSWO stimulus condition. Ned's top preference (i.e., computer) remained consistent across the MSWO and vocal nomination assessments. Consequently, Ned received the stimulus with the second highest ranking (i.e., peanuts) during MSWO sessions. Although unnecessary in the current study, situations in which two items received the highest possible rank (i.e., a tie) were resolved through additional administrations of the MSWO.

3.6.5 Initial CCC Training

CCC consists of three steps: (a) the learner studies an academic task (e.g., a math fact) and its answer, (b) the learner covers the task and provides an academic response, (c) the learner

compares the attempt to the correct problem (Skinner et al., 1997). In the event that the attempt made by the learner fails to match the correct answer, the learner repeats the CCC process (i.e., engages in a correction procedure). Research supports the use of CCC for a wide range of students, including those with LD (Becker, McLaughlin, Weber, & Gower, 2009; Hayden & McLaughlin, 2004), ID (Poncy, Skinner, & Jaspers, 2006), and ED (Cieslar, McLaughlin, & Derby, 2008; Skinner et al., 1989), across a range of academic subjects (e.g., science, math, spelling; McLaughlin & Skinner, 1996; Skinner et al., 1997).

During a 10-minute session prior to baseline, students received training in CCC. The CCC procedure was modeled using math facts unrelated to the student's remediation (i.e., digits 1-0). Students then demonstrated knowledge of the procedure on a sheet of 9 random math facts. The experimenter corrected errors. The students were also provided with an opportunity to practice correction procedures. Students received praise from the principal investigator upon correct demonstration of CCC. Training ceased after students correctly demonstrated the procedure over 5 consecutive math facts in 5 minutes. Students that did demonstrate proficient use of CCC were excluded from the study.

3.6.6 Baseline

The principal investigator conducted baseline sessions on consecutive school days, with one session occurring per day. Baseline was maintained over the course of three sessions in order to determine a VR schedule of reinforcement. The principal investigator instructed students to complete as many problems as possible without skipping ahead and did not provide further instruction or reinforcement. Students received 5 minutes to apply the CCC procedure; however, sessions were discontinued if (a) the student did not work for 30 seconds or (b) the student said,

"I'm done." The principal investigator informed the students of the escape rules prior to each session.

3.6.7 Variable ratio reinforcement schedule

The average student response rate during baseline sessions determined a variable-ratio reinforcement schedule (VR). VR entails the provision of reinforcement after an unpredictable number of responses and typically produces a high stable level of responding (Cooper et al., 2007). The mean number of responses required for reinforcement was calculated by increasing the average baseline student response rate per-minute by 15% (Cooper et al.). A random number generator provided a sequence of ratios that, when averaged, resulted in VR schedule matching the mean number of responses required for reinforcement. The VR schedule for each participating student appears in Table 3-2 (see Appendix G for Ned's VR schedule).

Table 3-2 Participant Variable Ratio (VR) Schedules

Student	Mean Baseline Responses Per Minute	VR
Chris	5.3	6
Frank	4.3	5
Stan	8.7	10

3.6.8 Experimental and control sessions

Experimental and control sessions (i.e., sessions identical to baseline condition) were conducted on consecutive school days. During treatment sessions, students received reinforcers identified through either the MSWO or vocal nomination. Regardless of the session, the principal investigator informed the students to answer problems in order. Two separate discriminative stimuli (i.e., prompts) were used to indicate the availability of a specific reinforcer. Students received a verbal prompt prior to each experimental session (e.g., "Today you will receive candy"). In addition, the color of CCC sheets varied with the experimental session. The discriminative stimuli were intended to expedite the emergence of differentiated responding during experimental conditions (Cooper et al., 2007). Each condition was maintained for 5 minutes. The principal investigator maintained the escape rules from baseline and reminded each student of the availability of escape prior to each experimental session

Correct use of CCC (i.e., use of all steps of CCC) was reinforced according to a VR schedule. As in Moher, Gould, Hegg, & Mahoney (2008), the experimenter deposited small increments of edible reinforcers or tokens representing 30-seconds of a preferred activity into a cup placed near the student. The principal investigator demonstrated the relationship between tokens and specific activities to the students prior to the initiation of CCC procedures. Reinforcers were delivered to the student following the session.

3.6.9 Preference Assessment Stability

To determine the extent to which the preferences hierarchies changed over the duration of experiment, participants ranked the stimulus items following the completion of the reinforcer

assessment sessions. For each student, the principle investigator conducted a single additional administration of the MSWO and vocal nomination assessments. Replication occurred approximately 60 days after the initial assessment. Ranks were determined using established MSWO and vocal nomination procedures.

3.6.10 Analysis

The alternating treatments design permits a direct comparison of the effects of stimuli identified through the MSWO choice-stimulus assessment and the RRS. The extent to which MSWO and vocal nomination identified similar reinforcers was determined using exact agreement and Spearman's rho. To facilitate comparisons between ratio (MSWO) and ordinal (vocal nomination) variables, the data collected from the MSWO was converted to ordinal ranks (1-7). Items that received the same score during the MSWO were assigned a composite rank derived from the mean of the corresponding ordinal values. For example, a tie for rank 2 between two items during the MSWO assessment resulted in an ordinal rank of 2.5 for each item. Preference stability was determined using the Pearson product-moment correlation (MSWO) and Spearman's rho (vocal nomination). All statistical procedures were performed using SPSS 21 (IBM, 2012). Instances in which both assessments assigned the same rank to a stimulus were considered agreements. Percentage agreement was determined by dividing the number of agreements by the number of disagreement plus agreements and multiplying by 100. A low agreement between the assessments would suggest that the two procedures evoked separate responses from the participants. The slope of the results of the assessment probes was determined using Microsoft Excel.

3.7 INTEROBSERVER AGREEMENT AND TREATMENT FIDELITY

3.7.1 Interobserver Agreement

The principal investigator and a second observer assessed all permanent products generated by the students—including the RRS, and multiplication probes—for accuracy. Agreement was calculated for all multiplication probes by dividing the average number of observed digits correct by the total number of digits and multiplying by 100. Preference assessments and CCC procedures were video-recorded and subsequently reviewed by a second observer. Agreement was defined as both observers recording the same order of stimulus selection and was calculated by dividing the total number of agreements by the total number of student selections. For CCC sessions, a second observer reviewed 20% of treatment sessions with a checklist used to determine the students' application of CCC. Agreement was calculated by dividing the smaller number of CCC observations by the larger number of CCC observations and multiplying by 100.

Interobserver agreement for the results of permanent products (i.e., RRS, math probes) and preference assessment sessions was 100%. Total interobserver agreement across participants and CCC sessions was 98% (range = 90% - 100%). For Chris, interobserver agreement averaged 97% (range = 90% - 100%). Average interobserver agreement for Frank and Stan was 100%, and 99%, respectively.

3.7.2 Treatment Fidelity

Preference assessment sessions, administered by the author, were videotaped and reviewed to ensure fidelity of administration. The observer used checklists (see Appendices Q and R) to

determine (a) the presence of all necessary materials, (b) enforcement of timekeeping procedures, and (c) the proper use of instructions related to the RRS, vocal nomination, and MSWO. During CCC, the experimenter observed students to maintain appropriate use of CCC through verbal redirection (e.g., "That's not quite right. Try that problem again"). A second observer reviewed video-recordings of preference assessments and CCC procedures. The observer used a checklist (see Appendix S) to determine (a) the presence of all necessary materials, (b) enforcement of timekeeping procedures, (c) proper use of instructions, (d) appropriate administration of reinforcement, and (e) appropriate use of CCC by the students.

Treatment fidelity data were collected for all RRS, vocal nomination, and MSWO sessions. Fidelity for the RRS and vocal nomination sessions was 100%. Average fidelity for the MSWO sessions was 94.6% (range = 91%-100%). Treatment fidelity for CCC sessions across all participants and experimental conditions was 100%.

3.8 SOCIAL VALIDITY

3.8.1 Teacher Survey

Following the experiment, the participating teacher completed a survey addressing her view of the techniques used in the experiment. The teacher answered questions pertaining to the use of reinforcers and preference assessments. In addition, the teacher commented on the performance of participating students during the experiment (see Appendix T).

3.8.2 Student Survey

Participants in the study also completed a survey (see Appendix U). The principal investigator delivered the survey in an interview format. Questions concerned the students' view of receiving reinforcement and the different preference assessments. Additional questions addressed the participants' attitudes toward CCC and their academic performance following the experiment.

4.0 RESULTS

4.1 PREFERENCE ASSESSMENT

4.1.1 Student Nomination

The students' nominated preferences appear in Table 4-1 (see Appendix I for Ned's nominated preferences). Average duration of the vocal nomination process for Chris, Frank, and Stan was 1 min 54 s (see Appendix J for the duration of Ned's vocal nomination sessions). Chris vocally nominated his preferences in 1 min 45 s during the initial assessment and 1 min during the final assessment. The durations of Frank's vocal nomination assessments were 1 min 39 s and 1 min 10 s, respectively. For Stan, the durations of the vocal nomination assessments were 2 min 15 s and 1 min 27 s, respectively.

Table 4-1 Student Preference Rankings Obtained from Initial Vocal Nomination Session

Student	1	2	3	4	5	6	7
Chris	Computer	OJ	Stickers	Apples	Cookies	Reading	HT
Frank	Soda	Computer	TV	Art	HT	Chips	Reading
Stan	Computer	PJ	HT	Art	TV	Reading	Stickers

Note. OJ = orange juice; HT = helping teacher; TV = watching television; PJ = pineapple juice.

4.1.2 MSWO Assessment

Figure 1 displays the MSWO item selection percentages for each student (see Appendix H for Ned's MSWO data). The vertical axis presents the percentage of trials in which an item was selected. Items featured in the stimulus array appear along the horizontal axis. Average administration time of the MSWO assessment for Chris, Frank, and Stan was 7 min 38 s (see Appendix J for duration of Ned's MSWO assessment). For Chris, the durations of initial and final MSWO administrations were 9 min 46 s and 6 min and 6s, respectively. The MSWO administration times for Frank ranged from 8 min 30 s to 9 min and 6 s. Stan completed the initial and final MSWO assessments in 6 min 4 s and 6 min 18 s, respectively.

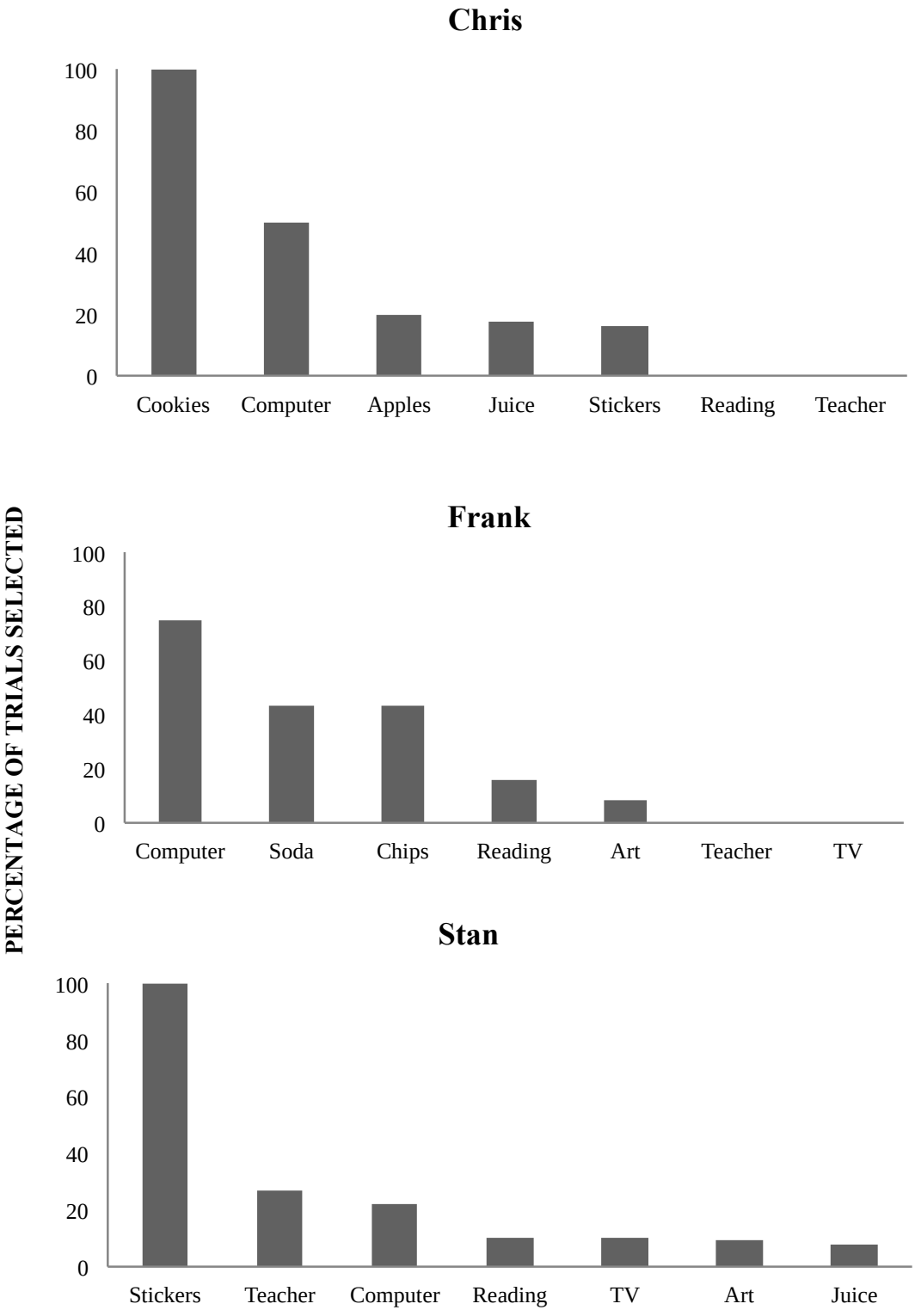


Figure 1 Percentage of trials on which students at-risk for ED selected available stimuli during the initial MSWO assessment

4.1.3 Comparison of Initial Preference Assessments

The results of vocal nomination and the MSWO were inconsistent (see Appendix J for Ned's data). For Chris, exact agreement for the top five stimuli identified by vocal nomination and MSWO was 0%. Correlation between the two preference hierarchies was moderate (r_s = .523, n = 7, p = .229). The RRS and MSWO placed only one identical stimulus within the top three preferences (computer). Orange juice and stickers—ranked second and third on the RRS—received respective rankings of fourth and fifth during the MSWO session. Chris' top ranked stimuli during the MSWO (cookies) received a fifth place ranking during the RRS. Likewise, apples, nominated at fourth place, received a third place ranking during the MSWO. The survey and the preference assessment identified the same low-preference items (reading, helping teacher).

Frank identified two of items (soda, time on the computer) as highly preferred regardless of the assessment format. Nonetheless, exact agreement between the two assessments was 0%. The results of the assessments were weakly correlated (r_s = .273, n = 7, p = .554). Frank's top preference differed based on the use of vocal nomination (soda) or the MSWO (computer). The items that garnered the lowest rating on the RRS (potato chips, reading) received ranks of third and fourth, respectively, during the MSWO assessment.

Exact agreement for Stan's top five stimuli was 20%. Vocal nomination and the MSWO assessment identified two of Stan's top three preferences (computer, helping teacher). However, a Spearman correlation revealed a weak negative relationship between the two assessment methods (r_s = -.321, n = 7, p = .482). The item ranked seventh through vocal nomination (stickers), received the highest rating during the MSWO. In addition, pineapple juice, which Stan nominated as his second preference, received the lowest ranking during the MSWO. Otherwise,

Stan demonstrated relatively minor changes in preference a result of the different assessment formats.

4.2 CCC SESSIONS

4.2.1 CCC Completion

Results for each participant appear in Figure 2 (see Appendix K for Ned's CCC data). Data are presented as the usage of complete CCC procedures per session. The vertical axis represents instances in which the students (a) applied all the steps of CCC to a math fact and (b) arrived at the correct answer to the math fact were recorded as a single occurrence of CCC. The horizontal axis represents consecutive calendar days. Data points correspond with the three conditions maintained throughout the experiment (MSWO, vocal nomination, control).

Chris exhibited differentiated responding across reinforcement conditions. The stratified pattern of responding suggests that the reinforcer identified under the MSWO evoked the highest rates of responding compared to the reinforcer identified through vocal nomination or the control condition. Response frequency under both reinforcer conditions exceeded the low level of responding exhibited during the control condition. Chris' responding during the control condition did not exceed the frequency established during the initial session (n =10) and decreased over the course of the experiment. The response trend during the vocal nomination condition, though initially positive, gradually decreased to control condition levels following a peak of 26 responses during session 9. In contrast, Chris sustained the positive trend exhibited during the MSWO condition until he reached a peak response frequency (n = 43) during session 25. The

level of responding during subsequent MSWO (range = 34-36), though slightly lower, exceeded the response levels in the nomination and control conditions.

Frank exhibited low levels of responding during all conditions, expressed an aversion to studying multiplication problems throughout the experiment (e.g. "I don't like to do these problems"), and corrected his initial CCC responses more frequently than either of his peers. Nonetheless, responding under both reinforcer conditions—though variable—exceeded the control condition. Whereas the level of CCC under the vocal nomination condition initially exceeded the alternate conditions (n = 25), the use of CCC under the MSWO condition gradually increased. The level of responding under the MSWO condition in session 18 (n = 24) approximated the level of responding under the vocal nomination condition in session 17 (n = 26). Following two prolonged absences, however, Frank's responding during both experimental conditions matched the low levels established during the control condition (n = 1). Nonetheless, Frank continued to exhibit higher levels of responding during subsequent vocal nomination and MSWO sessions. Use of the CCC over the final three MSWO sessions appeared to be stable (n = 18). Response trends for the vocal nomination condition exhibited a positive trend over the same period, culminating with a peak level of response in session 52 (n = 36). However, the lack of stratification in the level of responding under the reinforcer conditions suggests that neither the vocal nomination nor the MSWO reinforcer assessment identified a superior reinforcer.

Following an initially high frequency of responding during the initial control session (n = 45), Stan's responding during the control condition exhibited a sharp negative trend. Stan demonstrated a low level of responding during the control condition (range = 0-1). Although Stan exhibited similarly high levels of responding during both the MSWO and vocal nomination conditions, the trend for both conditions remained stable throughout the experiment. Responding

under both the vocal nomination and MSWO sessions (range = 47-56) exceeded the control condition. However, data for the two reinforcer conditions failed to stratify, as the level of responding remained similar regardless of the reinforcer condition. Stan opted to terminate session 31 rather than work for the nominated reinforcer. The cooperating teacher suggested that Stan's deviation from the previous pattern of responding possibly resulted from a punishment he received earlier in the school day. Following session 31, Stan resumed his previous pattern of responding during the vocal nomination sessions.

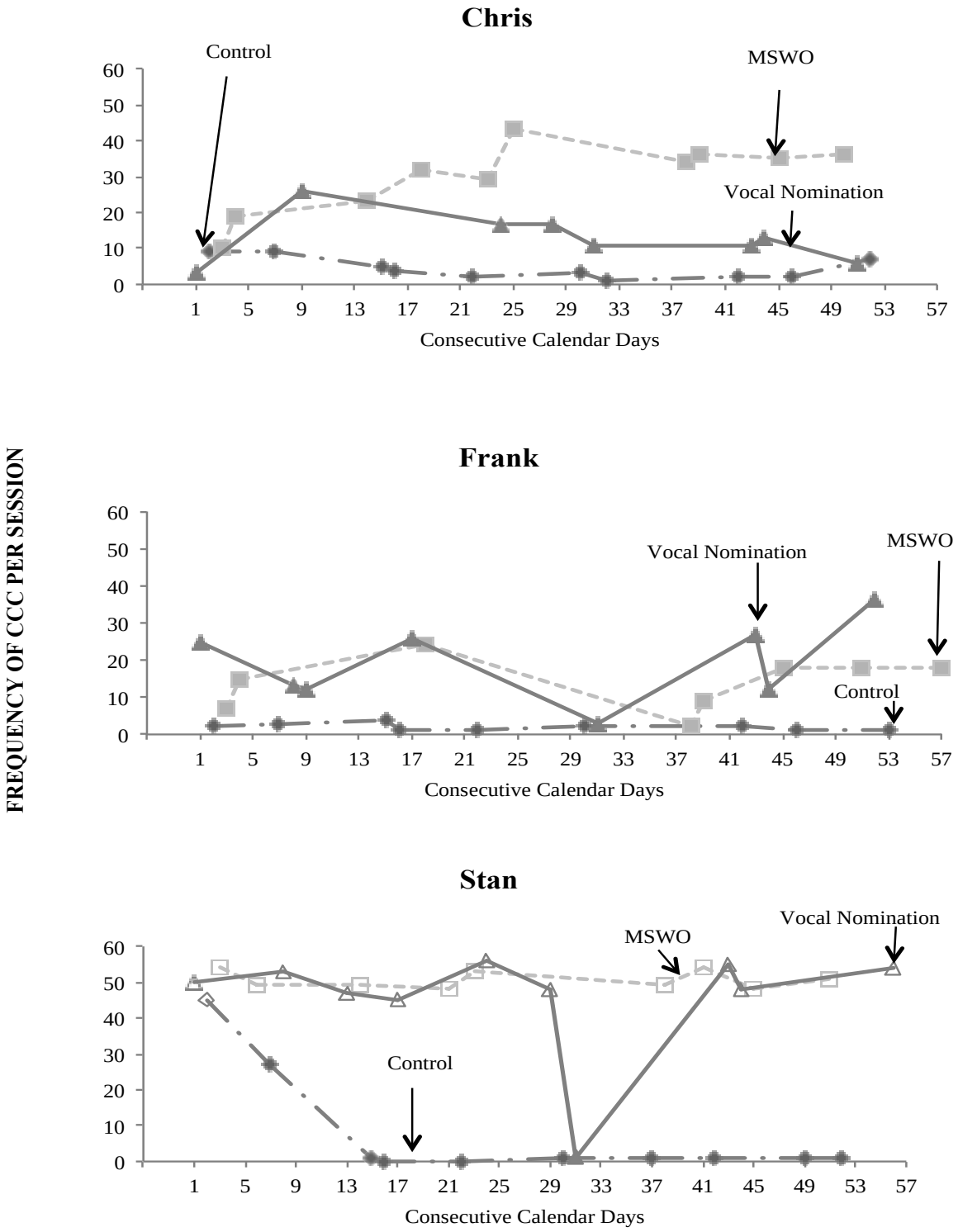


Figure 2 Participants' use of complete CCC procedures per session. Open data points represent full sessions. Closed data points represent sessions terminated by students.

4.2.2 Duration of CCC Sessions

Rather than work the entire duration (5 min), the students generally terminated (i.e., opted out) the CCC sessions. Compared to control, the use of the use of reinforcement appears to have extended the duration of the student's CCC use. Table 4-2 provides the duration for each session, a ratio of the total time students worked to the total available time within each condition, the percent of sessions the student opted out, and the cumulative use of CCC per condition (see Appendix L for Ned's data).

Notwithstanding Stan's performance during the sessions 1-2, the duration of time the students worked during the control sessions generally did not exceed 60 s. Chris and Frank opted out of every session regardless of the experimental condition. However, the number of CCC Chris completed directly corresponded with the length of each session. Chris exhibited the highest level of responding (297) and worked for a greater length of time under the MSWO condition (70% of total possible seconds). Frank, however, worked slightly longer during the vocal nomination condition (50.8% of total seconds) than in the MSWO condition (37.8%). The duration Frank worked each session reflects the variability observed in his levels of responding across reinforcer conditions (i.e., MSWO and vocal nomination). Stan opted out of the majority of control sessions (90%), but terminated very few MSWO (0%) or vocal nomination (10%) sessions. The cumulative duration of time Stan worked under the MSWO (100% of total seconds) and vocal nomination conditions (90.2% of total seconds) corresponds with the high, undifferentiated levels of responding observed across reinforcer conditions.

Table 4-2 Duration, Total Percent of Possible Time Worked, Percent of Sessions Opted Out, and Cumulative CCC Completion of Students During Reinforcer Assessment

	Chris			Frank			Stan		
Session	**Control (CD)**	**MSWO (CD)**	**VN (CD)**	**Control (CD)**	**MSWO (CD)**	**VN (CD)**	**Control (CD)**	**MSWO (CD)**	**VN (CD)**
1	61 s (2)	93 s (3)	31 s (1)	37 s (2)	87 s (3)	282 s (1)	300 s (2)	300 s (3)	300 s (1)
2	55 s (7)	142 s (4)	190 s (9)	20 s (7)	109 s (4)	90 s (8)	152 s (7)	300 s (6)	300 s (8)
3	32 s (15)	171 s (14)	117 s (24)	35 s (15)	245 s (18)	87 s (9)	5 s (15)	300 s (14)	300 s (13)
4	37 s (16)	259 s (18)	138 s (28)	5 s (16)	21 s (38)	258 s (17)	3 s (16)	300 s (21)	300 s (17)
5	11 s (22)	235 s (23)	59 s (31)	9 s (22)	58 s (39)	16 s (31)	3 s (22)	300 s (23)	300 s (24)
6	14 s (30)	283 s (25)	88 s (43)	15 s (30)	170 s (45)	191 s (43)	6 s (30)	300 s (38)	300 s (29)
7	5 s (32)	265 s (38)	64 s (44)	13 s (42)	99 s (51)	68 s (44)	4 s (37)	300 s (41)	5 s (31)
8	23 s (42)	209 s (39)	50 s (51)	5 s (46)	118 s (57)	229 s (52)	4 s (42)	300 s (45)	300 s (43)
9	9 s (46)	226 s (45)	N/A	6 s (53)	N/A	N/A	4 s (49)	300 s (51)	300 s (44)
10	46 s (52)	228 s (50)	N/A	N/A	N/A	N/A	4 s (52)	N/A	300 s (56)
POTENTIAL SESSION TIME	3000 s	3000 s	2400 s	2700 s	2400 s	2400 s	3000 s	2700 s	3000 s
PERCENT SESSIONS OPTED OUT	100	100	100	100	100	100	90	0	10
PERCENT POTENTIAL TIME WORKED	9.7	70.3	30.7	5.3	37.8	50.8	16.2	100	90.2
TOTAL CCC PER CONDITION	43	297	104	8	111	154	78	455	457

Note. CD = calendar day; MSWO = multiple-stimulus without replacement preference assessment; VN = vocal nomination. Duration presented in seconds. Sessions could not exceed 300 seconds. Potential time worked represents a proportion of the cumulative time worked per the total potential length of all sessions within each condition. Discrepancies in number of sessions administered to each student were due to inconsistent attendance among the students.

4.3 MATH FACT PERFORMANCE

Each of the students completed math fact probes during the screening process and throughout the experiment. Pre- and post-experiment scores appear in Table 4-2 (see Appendix M for Ned's math fact performance). Compared to screening, Chris and Frank exhibited marginal improvement on the math fact probes. Stan's performance, however, declined over the course of the study. Although students were not permitted to escape probe sessions, Stan repeatedly attempted to prematurely terminate probes by employing the escape rule (i.e., saying "I'm done" or waiting for thirty seconds) maintained during the CCC conditions. Consequently, the deterioration in Stan's performance may have resulted from the lack of reinforcement provided during the math fact probes. The results suggest that the CCC procedure did not improve students' acquisition of math facts over the course of the experiment.

Table 4-3 Student Performance on Math Fact Probes

	Chris		Frank		Stan	
Probe no.	**DCPM**	**DICPM**	**DCPM**	**DICPM**	**DCPM**	**DICPM**
1	4	4.5	1	2	14	0.5
2	2.5	0.5	1	2.8	14	0
3	3.5	0	0.08	0.08	13	0
4	5.5	0	0.6	2	8	0.5
5	2	0	2.8	2	6	0
6	3	0	*	*	7.5	0.5
7	5.5	0	1.1	2.8	7	0
8	3	1	0.8	1	7.5	0
Pre-M (SD)	3.33 (.76)	1.67 (2.46)	0.69 (.53)	1.62 (1.39)	13.66 (.57)	0.16 (.28)
Post-M (SD)	3.8 (1.6)	0.2 (.44)	1.32 (1)	1.95 (.73)	7.2 (.75)	0.2 (.27)

Note. Italicized probes occurred prior to the intervention. DCPM = digits correct per minute; DICPM = digits incorrect per minute.
*Student did not complete probe due to absences.

4.4 PREFERENCE ASSESSMENT STABILITY

Following the completion of the CCC sessions, the principal investigator conducted vocal nomination and MSWO preference assessment sessions with each student. Procedures were identical to those observed in the previous assessment. A table featuring directly comparing the results of each of the preference assessments appears in Appendix V. Results of the post-vocal nomination assessment appear in Table 4-3. Responses during the pre- and post-vocal nomination condition were not consistent. For Chris and Stan, exact agreement between the two vocal nomination sessions was 0%. Exact agreement for Frank was 20%. The results of a Spearman's correlation, though not significant, further suggest that Chris' nominated preferences varied considerably over the two administrations (r_s = -.464, n = 7, p = .294). Rankings

generated by Frank and Stan, however, were moderately correlated, yet failed to meet statistical significance (r_s = .500, n = 7, p = .253; r_s = .643, n = 7, p = .119, respectively).

Table 4-4 Student Preference Rankings Obtained from Final Vocal Nomination Session

Student	1	2	3	4	5	6	7
Chris	HT	Cookies	Computer	Apples	Reading	OJ	Stickers
Frank	Soda	TV	Chips	HT	Art	Computer	Reading
Stan	PJ	HT	Computer	Stickers	Art	Reading	TV

Note. HT = helping teacher; OJ = orange juice; TV = watching television; PJ = pineapple juice.

The results of the MSWO preference assessments (Figure 3) were relatively consistent. Unlike the vocal nomination assessment, repeated use of the MSWO identified the same top preference for each student. For Chris, agreement between the top five preferences was 20%. However, the strong positive correlation between the initial and final MSWO assessments was statistically significant (r = .758, n = 7, p = .048), suggesting that the results of the MSWO were more consistent than the vocal nomination assessment. Frank's MSWO sessions, though they displayed limited agreement (0%), were significant and strongly correlated (r = .886, n = 7 p = .008). Likewise, agreement for Stan's selections during the MSWO was 20%; nonetheless, the results appeared significantly consistent over the two administrations (r = .966, n = 7, p < .001).

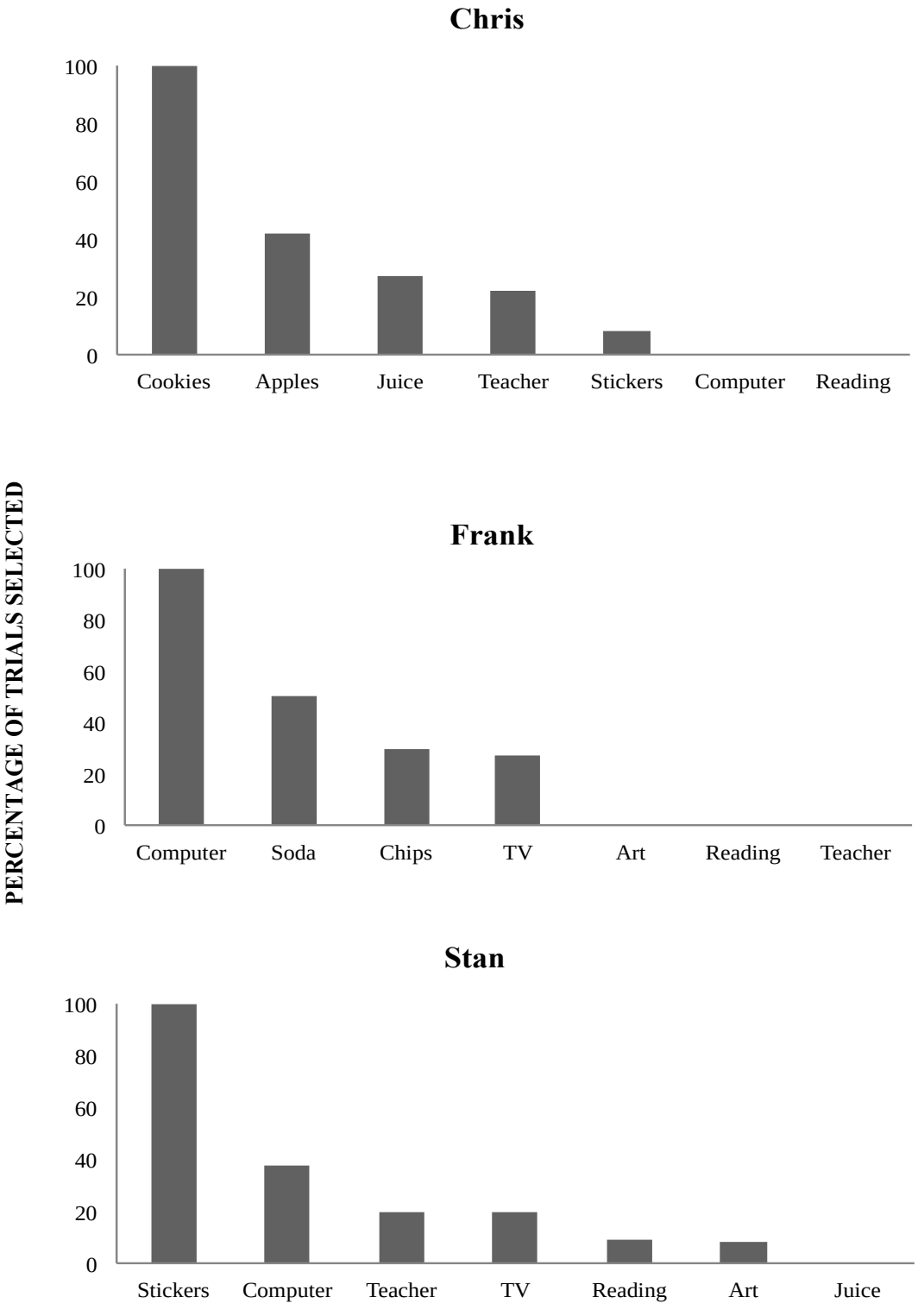


Figure 3 Percentage of trials on which students at-risk for ED selected available stimuli during the final MSWO assessment

4.5 SOCIAL VALIDITY

4.5.1 Teacher Survey

Results of the teacher survey were generally favorable. The teacher indicated that rewards used in the experiment were consistent with those typically offered by the school, and that students were generally consulted before they received rewards. However, the educator described the consultation method currently employed by the school as largely ineffective, and claimed that the students appeared to nominate preferences at random. Consequently, the educator considered MSWO assessment as an effective method of identifying reinforcers with the potential to improve the selection of rewards. Using a 5-point Likert scale, the teacher indicated that the children exhibited a greater degree of cooperation during the experiment when receiving reinforcement (5-point score). The teacher indicated that the use of reinforcement to increase performance is effective (4-point score) and appropriate (4-point score). Based on the results of the experiment, the educator claimed to be more likely to incorporate reinforcement in the classroom (4-point score) and to use the MSWO for the identification of reinforcers (5-point score).

4.5.2 Student Survey

Participating students rated specific aspects of the experiment using a 5-point Likert scale, with mixed results. All of the students (a) reported enjoying the rewards they received during the experiment (M = 5) (b) suggested that they were more likely to complete schoolwork for rewards (M = 5) and (c) claimed to enjoy selecting the rewards they earned (M = 4). Chris reported that

he would complete school assignments for the rewards he received during the experiment. However, the remaining students did not report a willingness to complete school assignments for the stimuli provided in either of the experimental conditions (M = 2.6). When asked to compare the reinforcers received in the vocal nomination and MSWO conditions, Chris and Frank selected the highest possible rating for each item and did not express a greater preference for either stimulus. Stan, however, indicated that he preferred the stimulus provided during the vocal nomination condition (5-point score) to the MSWO stimulus (3-point score).

5.0 DISCUSSION

In the current study, the principal investigator evaluated the effectiveness of choice-stimulus preference assessment—specifically, the MSWO assessment—in identifying reinforcers for children at-risk for ED. Participating students identified rewards through a vocal nomination procedure (i.e., vocal ranking) and an MSWO assessment in which students selected stimuli from an array. Analysis revealed limited agreement between the two preference assessments. A subsequent reinforcer assessment determined the influence of the respective stimuli on the students' use of CCC, an evidence-based form of math fact acquisition. Results suggested that, relative to a control condition, the stimuli selected with the vocal nomination and MSWO assessments functioned as reinforcers. For one of the students (Chris), the stimulus identified by the MSWO evoked higher levels of responding and greater durations of time on task. However, the remaining students (Frank and Stan) exhibited similar levels of responding regardless of the process used to select reinforcement. Follow-up administrations of the two preference assessments suggested that the results of the MSWO assessment remained more consistent over two administrations than the results of the vocal nomination procedure.

In contrast to much of the research concerning choice-stimulus preference assessment, the students in the current study possessed the ability to vocally nominate preferences. The limited agreement between the students' nominated preferences and MSWO selections partially support conclusions regarding the lack of correspondence in the behaviors and statements of

children at-risk for ED (Northup, 2000). However, the absence of response differentiation across reinforcement conditions for two of the students suggests that the discrepancy in preference ratings may have resulted from procedural factors rather than the inherent accuracy of choice-stimulus methods. As in previous studies that favorably compared choice-stimulus preference assessment to testimonial assignations of preference among students with- or at-risk for ED (e.g., Damon et al., 2008), the implementation of the MSWO in the current study provided students with direct access to stimuli. Although generally observed among individuals with severe disabilities (Bojak & Carr, 1999; DeLeon, Iwata, & Roscoe, 1997) food displacement—the tendency for individuals to select edibles over non-food items when presented concurrently in an array, represents one possible explanation for the disparity. The current study did not evaluate the influence of food displacement on the results of the choice-stimulus assessments. Given that the MSWO identified edibles as the highest preference for only one of the students (Chris), food displacement represents an unlikely explanation for the divergent findings of the two preference assessment methods.

Results of the reinforcer assessment offer moderate support for the use of MSWO preference assessment over vocal nomination in educational settings. Chris terminated sessions regardless of whether he received reinforcement. The stimulus identified via the MSWO, however, evoked an increase in responding and time-worked relative to both the vocal nomination and control conditions. Moreover, the initial vocal nomination assigned a relatively low rank to the stimulus associated with the highest level of responding (cookies). The inaccuracy of the vocal nomination assessment appears to support claims (e.g., Vollmer & Iwata, 1992) regarding the tendency of testimonial nominations to produce "false negatives" that routinely result in the failure of consequence based treatment. In the current experiment, use of

the MSWO produced a more accurate assessment of Chris' preferences, which resulted in a higher level of responding during the reinforcement assessment.

The lack of differentiation across reinforcement conditions observed for Frank and Stan, however, potentially undermines the conclusions regarding the effectiveness of choice-stimulus preference assessment. Although outcomes of the control condition suggest that CCC did not function as a reinforcer, the task may not have been sufficiently difficult to result in differentiated responding under reward conditions. Alternatively, the lack of response differentiation could stem from the general similarity between items vocally identified as highly preferred and items that appeared within the high preference range established by the MSWO. As noted by DeLeon and Iwata (1996), the repeated availability of the most preferred items during the MSWO tends to produce artificially lower rankings for items that, in the absence of competing stimuli, could effectively function as reinforcers. Consequently, the ranking criteria applied by Carr et al. (2000) related general assignations of preference (e.g., high preference, low preference) to ranges of MSWO derived rankings (i.e., rankings 1-3 would be considered highly preferred). For Stan, the homogeneity in responding and session duration appears more consistent with the results of the MSWO, which placed stickers and computer use in the highly preferred range. In contrast, the results of vocal nomination incorrectly indicated that stickers would not function as a reinforcer.

Frank's use of CCC suggests that the reinforcing value of the selected stimuli were approximately equivalent. Compared to control, Frank worked for longer periods when provided with reinforcement. Nonetheless, neither item prevented Frank from opting out of session nor evoked consistently high levels of responding relative to the control condition. The MSWO identified soda and time on the computer as within the high preference range established by Carr

et al. (2000). Although Frank's modest use of CCC potentially highlights an inability of either preference assessment to identify reinforcers, several additional factors may have affected his performance. As with previous studies conducted in educational settings (e.g., Berkowitz & Martens, 2001), teachers approved all of the items featured on the assessment. Frank did not have the opportunity to select contextually inappropriate items or activities (e.g., mature-rated video games) with the potential to evoke higher levels of responding. Frank also missed several consecutive sessions due to testing, illness, and other unspecified reasons. These factors, combined with the severity of his behavior (i.e., depression), may explain Frank's inconsistent application of CCC.

Notwithstanding variations in preference based on individual experiences over time, the generally high correlation between the initial and final MSWO assessments provide further support for the stability of choice-stimulus preference assessments (Hanley, Iwata, & Roscoe, 2006). Moreover, the current findings remain consistent with previous conclusions (Northup et al., 1996) regarding the superior stability of the choice-stimulus preference assessments over testimonial nominations of preference. Severe fluctuations in the preference hierarchies generated during the nomination condition (e.g., Stan) have the potential to undermine confidence in reinforcement-based interventions derived from testimonial assessments of preference. For Chris and Stan, the MSWO identified effective reinforcers (cookies and stickers, respectively) that received deceptively low rankings during vocal nomination. Furthermore, the relative consistency of choice-stimulus assessment methods suggests that (a) choice-stimulus assessments constitute a dependable basis for the selection of potential reinforcers and (b) replications of the assessment may be kept to a minimum in the interest of preserving instructional time (Carr et al., 2000).

Relative to baseline, the contingent administration of stimuli increased responding among all participants; nonetheless, the increased use of CCC did not produce improvement in the acquisition of math facts. Several factors related to the orientation of the study (i.e., the effectiveness of preference assessment rather than the effectiveness of reinforcement and CCC) may have contributed to the limited success of CCC. The control condition, though necessary to evaluate the efficacy of reinforcement, resulted in low levels of responding across participants. When combined with the students' infrequent attendance as well as the vagaries of the school schedule, many students had little opportunity to perform high levels of CCC on a routine basis. In addition, research concerning the use of CCC suggests that students at-risk for ED may require reinforcement before completing math probes (e.g., Bolich, Kavon, McLaughlin, Williams, & Urlacher, 1995). In order to maintain consistency of the pre- and post-experiment math assessments, minimize the potential effects of satiation on the results of the reinforcer assessment (Hanley et al., 2006), and maintain the consistency of the daily CCC conditions, students in the current study did not receive reinforcement during the completion of math probes. The lack of reinforcement may have resulted in artificially low math scores on the assessment probes.

5.1 LIMITATIONS

The current study has three notable limitations. First, as in previous studies concerning choice-stimulus preference assessment for students with- or at-risk of ED, the effect of reinforcement conditions was determined using an alternating treatment design. The rapid alternation of reinforcers may have resulted in a novelty effect, wherein satiation with a previous reinforcer

produces temporarily higher levels of responding under a novel reinforcement condition. A reversal or multiple-baseline design would have provided stronger evidence of the consistent effect of reinforcement overtime. Nonetheless, the use of the alternating treatments design in the current study (a) facilitates comparisons with much of the previous work concerning choice-stimulus preference assessments and (b) provides an opportunity to demonstrate experimental control within the school context. Second, the presentation of items from different stimulus classes (e.g., edibles, activities) in the array may have distorted the results of the preference assessment. The current study extends research concerning the potential effects of assessing preference using multiple stimulus classes. With few exceptions (Damon et al., 2008; Kuhn et al., 2006; Resetar & Noell, 2008), research concerning preference assessment and students with ED generally required students to select stimuli from a single stimulus class (e.g., edibles; Paramore & Higbee, 2005). Finally, the reinforcer assessment did not involve academic tasks typically assigned to the students or occur within inclusive environments frequently prescribed for students with exceptionalities. Nonetheless, the use of evidence-based math instruction for struggling students within their typical educational environment (e.g., regularly scheduled remediation periods), as evidenced by the control condition, reduced potential instances of escape-motivated responding and constituted an improvement over the contrivances featured in previous evaluations of choice-stimulus preference assessments (e.g., Daly et al., 2009).

5.2 IMPLICATIONS FOR PRACTICE

Given the prominent role of reinforcement in effecting behavior change, the results have important implications for practitioners. The stimuli identified during the initial MSWO

functioned as reinforcers and, for one of the students (Chris), were associated with the highest level of responding. Practices that result in the accurate identification of reinforcers can prevent the failure of consequence-based interventions for students at-risk for ED in educational settings (Vollmer & Iwata, 1992).

Previous studies (e.g., Damon et al., 2008; Volz & Cook, 2009) suggest that—relative to testimonial methods—choice-stimulus preference assessment potentially impinges upon the resources and instructional time of practitioners. The current study, however, supports the use of MSWO in educational settings. The MSWO identified reinforcers incorrectly rejected during vocal nomination (for Chris and Stan), required little time to administer, and produced stable results compared to the nomination condition. Despite the general recommendation that practitioners frequently assess preferences (Hanley et al., 2006), the use of a reliable form of preference assessment could potentially save practitioners time when compared to the demands of less stable assessment methods (e.g., nomination).

Although an experienced graduate student conducted all procedures, the participating educator indicated a willingness to use the choice-stimulus assessment in future student evaluations. The instructor further described the token economy system as unwieldy and suggested that students did not appear to nominate effective reinforcers. Choice-stimulus preference assessments may be a useful tool for teachers who do not have the resources to provide a wide range of back-up reinforcers in a token economy (e.g., Montarello & Martens, 2005; Sran & Borrero, 2010) or for students who cannot otherwise identify reinforcers. As students may require large amounts of an item, it may be far more practical for educators to identify one or two effective reinforcers as opposed to carrying considerable quantities of every potential reward.

5.3 DIRECTIONS FOR FUTURE RESEARCH

The results of the current study contribute to earlier findings (e.g., Northup, 1996) that support the use of choice-stimulus preference assessment over testimonial nominations of preference for students with- or at-risk for ED. Studies concerning the value of systematic, behavior-based preference assessments for this population, however, remain limited. The need for effective methods of reinforcement identification extends beyond students with severe disabilities (Ivancic, 2000). Researchers should continue to compare the results of choice-stimulus assessment to ranked interviews and other vocal assessment formats within inclusive learning contexts. Given that the alternating treatment design may not reveal differences in responding evoked by highly preferred items, future comparisons of testimonial and choice-stimulus methods may wish to use a concurrent operants reinforcement assessment in which students are prompted to complete two equivalent tasks corresponding to two separate items during each experimental session.

A number of studies involving individuals with severe disabilities address the potential influence of procedural factors on the results of preference assessments. Additional studies for individuals with severe disabilities have examined the stability of individual preferences over time. However, examinations of preference stability (e.g., Hanley et al., 2006) or comparisons of the different formats of choice-stimulus preference assessment (Deleon & Iwata, 1996) have yet to involve students with ED. Studies concerning the effect of featuring stimuli from various stimulus classes on students' identification of preferences (e.g., Deleon et al., 1997), in which experimenters compared the results of choice-stimulus assessments featuring uniform and diverse stimuli, should also be replicated among verbal populations. In general, the robust

literature concerning the use of choice-stimulus preference assessment for students with severe disabilities should be extended to encompass verbal student populations.

Research currently attributes the variation in the findings of preference assessments to the idiosyncrasies of individual participants (Hanley et al., 2006). In addition to examining effect of procedural factors on the outcomes, future research should examine the possible influence of individual characteristics (e.g., verbal ability, IQ) on (a) the results of choice-stimulus preference assessment and (b) the lack of correspondence between testimonial and choice-stimulus preference assessments. Identifying traits associated with patterns of responding may assist treatment providers in developing educational programs for individuals with disabilities. In as much as the determination of relationships between treatment outcomes and the traits of participants does not generally fall within the purview of visual analysis, future single-subject research could benefit from inferential statistical methods. Although the serial dependency of single subject data can distort conventional methods of statistical analysis (e.g., regression), hierarchical linear modeling (HLM)—a procedure commonly reserved for longitudinal analysis—may facilitate the examination of individual characteristics and preference (Davis et al., 2013).

Previous literature concerning the use of CCC focused on outcome measures (i.e., math probes) rather than the use of the CCC procedure by participating students. Despite the lack of improvement in the students' performance of math facts, the current study does not challenge presumptions regarding the positive effect of increasing the use of acquisition strategies. Future studies should continue to examine the effect of consistently combining reinforcement with evidence-based education strategies.

5.4 CONCLUSIONS

Researchers examining optimal practices for students with- and at-risk for ED often identify reinforcers using choice-stimulus preference assessment (e.g., Reed & Martens, 2011). Nonetheless, the literature does not yet provide sufficient evidence to support the use of choice-stimulus preference assessment for students capable of vocally nominating their preferences. Identifying effective forms of reinforcement identification represents a critical concern for educators given the prevalence of consequence interventions and the fundamental role of reinforcement in behavior methodology (Cooper et al., 2007). The current study, though inconclusive, provides further support for the use of choice-stimulus preference assessment among students with- or at-risk for ED. Results suggest that, in select cases, choice-stimulus preference assessment potentially identifies more effective reinforcers than vocal nomination and remains more stable over multiple administrations (n = 2). The duration required for the administration and the testimony of the participating teacher further suggest that the MSWO may be a feasible addition to the behavior programs implemented in educational settings. Recent emphasis on the use of effective practices in education underscores the importance of feasible behavior-based instructional decision-making. Consequently, choice-stimulus preference assessment could constitute a prerequisite for behavior interventions in educational settings.

APPENDIX A

SCHOOL ACCEPTANCE LETTER

PROPEL SCHOOLS℠
INSPIRING ACHIEVEMENT

May 3, 2012

Dear Mr. King,

I am writing to express our support for your project examining the effectiveness of choice-stimulus reinforcer identification for children with emotional disturbance. We believe that the opportunities outlined in the proposal will be of great benefit to the students in our school district. We look forward to supporting you as you implement research based instruction that will improve math outcomes for our students and general practices related to the identification of reinforcers.

We wish you luck in conducting the experiment and are eager to begin collaborating.

Sincerely,

Mandi Davis Skerbetz
Director of Pupil Services

3447 East Carson Street, Ste. 200 ▯ Pittsburgh, PA 15203 ▯ 412.325.7305 ▯ 412.325.7309 Fax
propelschools.org

APPENDIX B

PARENTAL CONSENT LETTER

Consent to Act as a Participant
Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Principal Investigator: Seth A. King | 412.383.8337| sak131@pitt.edu
Study Title: Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Dear Parent:

I am a doctoral student in the School of Education at the University of Pittsburgh. I am conducting a research study focused on the rewards for children with emotional disturbance (ED) or behavior problems. I would greatly appreciate your permission to conduct this study with your child.

Why is this research being done?

The purpose of this project is to determine whether a choice-test more effectively identifies rewards for children with ED than a survey. These rewards would be used to encourage your child to complete math assignments. The math assignments may improve your child's ability to perform multiplication.

Who is being asked to take part in this research study?

You are being contacted because you have been identified as being the parent of a child who may be eligible. To be eligible, a child must be:
(a) Between the ages of 6 and 12;
(b) Identified as having ED or other behavioral issue
(c) Identified as having difficulty with basic math facts (e.g., addition, multiplication);
(d) A native speaker of English.

What will I be asked to do if I allow my child to participate?

1. You will be asked to complete the information at the end of this letter and return it to us at the University of Pittsburgh as soon as possible. Please keep a copy of this form.

2. After receiving your form, I will schedule a screening at the school. At this time, please collect a copy of your child's most recent Individualized Education Plan (IEP) and send this to me.

What will my child be asked to do if she or he participates?

1. I will conduct an in-person visit to your child's school. I will ask your child if he or she wishes to participate. I will also administer a math test to your child to determine if he or she will benefit from the math assignments. The test will take no longer than 15 minutes to complete and will be administered in your child's regular classroom.

2. I will identify rewards that your child likes using a brief survey. I will name things that children occasionally receive in school as rewards (e.g., candy, reading time). I will then ask your child to tell me how much they like these items. The survey will take no longer than 10 minutes to complete and will be administered in a private setting. In order to ensure that I deliver the survey correctly, a video recording of the choice-test will be made and kept at the University of Pittsburgh.

3. I will also identify rewards that your child likes using a choice test. For the choice-test, I will allow your child to eat or play with things your child occasionally receives in school. The choice-test will take no longer than 30 minutes to complete and will be administered in a private setting. In order to ensure that I deliver the choice-test correctly, a video recording of the choice-test will be made and kept at the University of Pittsburgh.

4. I will teach your child to complete a math assignment. The math assignment will take no longer than 10 minutes and will be administered in your child's classroom. During the assignment, your child will: (1) study a math problem and its answer, (2) cover the answer and try to answer the problem on his or her own, and (3) compare his or her answer to the correct answer.

5. Beginning in January, I will give your child the assignment every school day. On some days, your child will receive access to a small reward for completing the math assignment. On other days, your child will not receive access to a small reward for completing the math assignment. The study should end in March 2013. In order to ensure that I deliver the instruction correctly, video recordings of all instruction sessions will be made and kept at the University of Pittsburgh.

6. At the end of the study, I will ask your child to provide his or her opinion of the math assignment.

What are the potential risks of this study?

Your child's participation in this study poses a few risks:

1. I may give your child small amounts of food (e.g., chocolate, potato chips) during the study. You will be asked to provide information related to any food allergies your child may have.

2. There is a possibility your child may not like taking tests. I will try to avoid this by providing encouragement during the test.

3. Your child may also miss some instructional time in order to complete the survey. I will attempt to limit the amount of instructional time your child misses by coordinating the testing with your child's teacher.

4. There is also an unlikely risk for a breach of confidentiality. Procedures to avoid this risk are outlined below under "Who will know about my child's participation in this research study?"

What are the potential benefits of taking part in this study?

Children participating in the study may benefit from the math intervention. However, there is no guarantee that your child will benefit from the instruction.

Will I be paid if my child takes part in this research study?

Should your child choose to participate, you will receive a $25 WePay gift card at the conclusion of the study. Should your child choose to withdraw, you will receive $3.00 of the total amount for each week of your child's participation.

Who will know about my child's participation in this research study?

Any information about you or your child obtained from this study will be kept confidential. Reports will not name any individual or school. Video recordings will be used only for research purposes unless permission is provided to use these in professional presentations. Recordings will be stored in a secure, locked office at the University of Pittsburgh. No identifying information will be included in the transcription of the recordings.

In unusual cases, your child's research records may be released in response to an order from a court of law. It is also possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office may review your child's data for the purpose of monitoring the conduct of this study.

Is my child's participation in this research study voluntary?

Yes, your child's participation in this research study is completely voluntary. If you decide not to take part, no negative consequences will occur. Your decision to allow your child to participate will not affect any other activities your child participates in at his or her school or with the University of Pittsburgh. Finally, if you agree to allow your child to participate, please

understand that you may withdraw your child at any time. If you do withdraw, this will not affect any other activities you participate in at your child's school or with the University of Pittsburgh. If you decide to withdraw please do not hesitate to contact me.

Who do I contact if I have questions?

Please contact me if you would like more information or if you have questions about any part of this letter. Also, if you have any general questions about giving consent or about your rights as a research participant, you may call the Human Subject Protection Advocate at the University of Pittsburgh at 1-866-212-2668.

If you would like to participate, please complete the form below and return it to me at your earliest convenience. Thank you very much.
Sincerely,

Seth A. King,
Principal Investigator,
412.383.8337| sak131@pitt.edu
University of Pittsburgh, Department of Instruction & Learning
5150 Posvar Hall, 230 S. Bouquet St., Pittsburgh, PA 15260

PERMISSION FORM FOR:

Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Please complete all items and return to the address below at your earliest convenience. If you would like a postage-paid return envelope, please contact Seth King at sak131@pitt.edu or 412.383.8337 *and provide your name and mailing address.*

Seth King
University of Pittsburgh, Department of Instruction & Learning
5150 Posvar Hall,
230 S. Bouquet St., Pittsburgh, PA 15260

I understand the information above and have had all of my questions answered. I understand that I am encouraged to ask questions, voice concerns or complaints about any aspect of this study, and my questions, concerns or complaints will be answered by the investigator(s) listed on the the first page of this letter at the telephone number given. I understand that my child will be videotaped during the course of this study. I understand that I may always request that a listed investigator address my questions, concerns or complaints. I understand that I may contact the Human Subjects Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668) to discuss problems, concerns and questions. A copy of this consent form will be given to me. I understand that, as a minor (age less than 18 years), the above-named child is not permitted to participate in this research study without my permission. Therefore, by checking 'Yes' and signing this form, I give my consent for his/her participation in this research study.

___ **YES**, I agree to allow my child, _____, to participate in the study.

_____ _____

Parent Name Date

_____

Parent Signature

2. Permission to Include Video in Professional Presentations (Optional)

___ **YES**, I agree to give permission for research staff to use my child's video recordings collected as part of this study during professional presentations. I understand that my child's name or school will not be disclosed, but that she or he may be identified if an audience member recognizes her or his voice or appearance. I understand that I do not have to give this permission for my child to participate in this study and that my child's participation and/or selection for the study will not be affected by my choice to allow or NOT allow her or his video recordings to be shared.

___ **NO**, I DO NOT agree to give permission for research staff to use my child's video recording collected as part of this study during professional presentations. I understand that I do not have to give this permission for my child to participate in this study and that her or his participation and/or selection for the study will not be affected by my choice to allow or NOT allow her or his video recordings to be shared.

3. Notification of Food Allergies
Please check one of the following choices:
____**YES,** I understand that the proposed study involves the dissemination of food items, and verify that, to the best of my knowledge, my child has no food allergies.
____**YES,** I understand that the proposed study involves the dissemination of food items. My child is allergic to the following foods (please list food allergies in the space below):
_____

_____

Please list any additional concerns related to food items in the space below (optional):

_____

_____

4. Contact Information
Parent Name:_____
Child's Name:_____
Child's Grade:_____
Primary Parent Phone Number:_____
Alternate Phone Number:_____
Email Address:_____

(NOTE: You may stop. Next page is to be completed prior to screening.)

Assent to Act as a Participant
Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

THIS FORM WILL BE COMPLETED PRIOR TO SCREENING

Principal Investigator: Seth A. King | 412.724.7251 | sak131@pitt.edu
Study Title: Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Instructions: Explain study to child in age appropriate language and allow child an opportunity to ask questions about the study. After answering any questions ask the child, "Do you agree to participate in this study?"

- If 'Yes,' complete this page and proceed. *(Assist child with completing item 1 and then you complete item 2.)*
- If 'No,' do not assess the child.

1.) This research study has been explained to me and I agree to participate.

_____ _____
Signature of Minor Participant Date

2.) I certify that I have carefully explained the purpose and nature of this research to study the child in age appropriate language. He/she has had an opportunity to discuss it with me in detail. I have answered all his/her questions and he/she has provided affirmative agreement (i.e., assent) to participate in this study.

_____ _____
Primary Investigator's Signature Date

_____
Primary Investigator's Printed Name

APPENDIX C

PRINCIPAL CONSENT FORM

Permission Form

Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Principal Investigator: Seth A. King | 828.448.0950 | sak131@pitt.edu

Study Title: Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Dear Principal:

I am a doctoral student in the School of Education at the University of Pittsburgh. I am conducting a research study focused on the identification of reinforcers (incentives) for children with emotional disturbance (ED) or behavior problems. I would greatly appreciate your permission to conduct this study at your campus. If you have any questions or need any additional information after reading this letter, please contact me at sak131@pitt.edu or 828.448.0950.

Why is this research being done?

The study focuses on evaluating the effectiveness of assessments designed to identify incentives that can assist teachers in building appropriate academic for children with ED. The purpose of this project is to determine whether a choice-stimulus preference assessment, whereby children select tangible items (e.g., candy) from an array, more effectively identifies incentives than a survey. These incentives would then be used to encourage a child at your school to participate in a brief, evidence-based form of math instruction.

Who is being asked to take part in this research study?

The project requires no more than five child participants. To be eligible, a child must be:
(a) Between the ages of 6 and 12;
(b) Identified as having ED or nominated by a teacher as having a behavior problem;

(c) Identified as having difficulty with basic multiplication facts (i.e., factors 0-9);
(d) A native speaker of English;

What will children be required to do if they decide to participate?

If you give permission, and the parent provides consent, the child will participate in the following activities:

- First, I would schedule a screening visit. During this I will: (a) administer a brief math assessment to the child and (b) obtain verbal assent to participate from each of the children.
- Second, I will assess the preferences—in terms of edible items—of qualifying children using a survey and a choice-assessment method.
- Third, I will administer a brief (15-20 minutes) math intervention to participating children several times per week for no more than eight weeks. The intervention consists of three steps: (a) the learner studies an academic task (e.g., a math fact) and its answer, (b) the learner covers the task and provides a response, (c) the learner compares the attempt to the correct problem. In the event that the attempt made by the learner fails to match the correct answer, the learner repeats the process. The children will receive access to a small amount preferred item as a reward for participating in the math intervention. Video recordings of all instruction sessions will be made and kept at the University of Pittsburgh.

What will the teacher at my school be asked to do if I give permission for the study to take place on my campus?

If you give permission and the teacher decides to participate, the teacher will be asked to do the following activities:

- Read an instructor consent form carefully, contacts us with any questions, and return the signed consent form to us. We will provide the instructor with a copy of this form.
- The teacher will be periodically interviewed in order to gain his or her perspective on the intervention.

What are the potential benefits of taking part in this study?

The study has the potential to improve the participating child's acquisition of basic multiplication facts. The information gained in the study will also further the ability of teachers to more effectively identify incentives for children with ED.

Thank you for your consideration.

Sincerely,

Seth A. King,
Principal Investigator,
828.448.0950 | sak131@pitt.edu
University of Pittsburgh, Department of Instruction & Learning
5150 Posvar Hall, 230 S. Bouquet St., Pittsburgh, PA 15260

Principal Permission Form

Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

___ **YES**, I provide permission for this study to take place at my school. No additional procedures are required by our district for approval.

___ **YES**, I provide permission for this study to take place at my school. *However*, additional procedures are required in our district before the study can be approved. (*Note:* We will follow up with you and complete the required procedures prior to initiating the study.)

___ **NO**, I do not provide permission for study to take place at my school.

_____
Principal Name

_____
School District

_____ _____
School Name School Phone

_____
School Address

_____ _____
Principal Signature Date

APPENDIX D

TEACHER CONSENT FORM

Consent to Act as a Participant
Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Principal Investigator: Seth A. King | 828.448.0950 | sak131@pitt.edu
Study Title: Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Dear Instructor:

I am a doctoral student in the School of Education at the University of Pittsburgh. I am conducting a research study focused on the identification of reinforcers (incentives) for children with emotional disturbance (ED). I would greatly appreciate your permission to conduct this study at your campus. If you have any questions or need any additional information after reading this letter, please contact me at sak131@pitt.edu or 828.448.0950.

Why is this research being done?

This study focuses on evaluating the effectiveness of assessments designed to identify incentives that can assist teachers in building appropriate academic for children with ED. The purpose of this project is to determine whether a choice-stimulus preference assessment, whereby children select tangible items (e.g., candy) from an array, more effectively identifies incentives than a survey. These incentives would then be used to encourage a child in your classroom to participate in a brief, evidence-based form of math instruction.

Who is being asked to take part in this research study?

You are being contacted because you teach an eligible child whose parent is interested in having him or her participate in this study and the parent would like you to participate as well. To be eligible, a child must be:
(a) Between the ages of 6 and 12;

(b) Identified as having ED or nominated by a teacher as presenting challenging behavior;
(c) Identified as having difficulty with basic math facts (i.e., addition, multiplication);
(d) A native speaker of English.

What will I be asked to do if participate?

If you decide to participate, you will be asked to do the following:

3. Read this consent form carefully. Please do not hesitate to contact me with questions or concerns. You may also want to discuss this study with your child's principal and teacher.

4. You will be asked to complete the information at the end of this letter and return it to me at the University of Pittsburgh at your earliest convenience. Please keep a copy of this form.

5. After I receive your form, I will ask you to distribute consent materials to students that are eligible to complete in the study.

6. Once I have received consent letters from parents, I will schedule a screening visit to the school. During this visit, I will administer a brief assessment to determine if your student is eligible.

7. If your student qualifies, I will ask you to answer questions regarding the behavior of the participating child. I will also ask you to complete a brief survey concerning the types of rewards you would use in the classroom. Finally, I will ask you to evaluate the child's engagement with current instruction and to provide a description of effective strategies for the child.

What will children be required to do if they decide to participate?

If you give permission, and the parent provides consent, the child will participate in the following activities:

- First, I would schedule a screening visit. During this I will: (a) administer a brief math assessment to the child and (b) obtain verbal assent to participate from each of the children.

- Second, I will assess the preferences of qualifying children using a survey and a choice-assessment method.

- Third, I will administer a brief (15-20 minutes) math intervention to participating children several times per week for no more than eight weeks. The intervention consists of three steps: (a) the learner studies an academic task (e.g., a math fact) and its answer, (b) the learner covers the task and provides a response, (c) the learner compares the attempt to the correct problem. In the event that the attempt made by the learner fails to match the correct answer, the learner repeats the process. The children will receive access to a small amount preferred item as a reward for participating in the math intervention. Video recordings of all instruction sessions will be made and kept at the University of Pittsburgh.

What are the potential risks of this study?

Your participation in this study poses minimal risks. There is a possibility you may experience discomfort from being interviewed. I will try to minimize these inconveniences by providing you with clear instructions. There is also an unlikely risk for a breach of confidentiality. My procedures to minimize this risk are outline below under "Who will know about my participation in this research study?"

What are the potential benefits of taking part in this study?

This study may improve the participating child's math skills. The information gained in the study will also further the ability of teachers to more effectively identify reinforcers for children with ED.

Will I be paid if I take part in this research study?

Should you choose to participate, you will receive a $25 WePay gift card at the conclusion of the study. Should you choose to withdraw, you will receive $3.00 of the total amount for each week of your participation.

Who will know about my participation in this research study?

Any information about you or your students obtained from this study will be kept confidential. Reports will not name any individual or school. Video recordings will be used only for research purposes unless permission is provided to use these in professional presentations. Recordings will be stored in a secure, locked office at the University of Pittsburgh. No identifying information will be included in the transcription of the recordings.

In unusual cases, your research records may be released in response to an order from a court of law. It is also possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office may review your data for the purpose of monitoring the conduct of this study.

Is my participation in this research study voluntary?

Yes, your participation in this research study is completely voluntary. If you decide not to take part, please understand that no negative consequences will occur. Finally, if you agree to participate, please understand that this participation is voluntary and you may withdraw at any time. If you do withdraw, this will not affect any other activities you participate in at your school or with the University of Pittsburgh. If you decide to withdraw please contact me at sak131@pitt.edu of 828.448.0950.

Who do I contact if I have questions?

Please contact me if you would like more information or if you have questions about any part of this letter. Also, if you have any general questions about giving consent or about your rights as a research participant, you may call the Human Subject Protection Advocate at the University of Pittsburgh at 1-866-212-2668.

If you would like to participate, please complete the form below and return it to me at your earliest convenience. Thank you very much.

Sincerely,

Seth A. King,
Principal Investigator,
828.448.0950 | sak131@pitt.edu
University of Pittsburgh, Department of Instruction & Learning
5150 Posvar Hall, 230 S. Bouquet St., Pittsburgh, PA 15260

CONSENT FORM FOR:

Examining the Effectiveness of Choice-Stimulus Reinforcer Identification on the Academic Task Performance of Children with Emotional Disturbance

Please complete all items and return to the address below at your earliest convenience. If you would like a postage-paid return envelope, please contact Seth King at sak131@pitt.edu or 828-448-0950 *and provide your name and mailing address.*

Seth King
University of Pittsburgh, Department of Instruction & Learning
5150 Posvar Hall,
230 S. Bouquet St., Pittsburgh, PA 15260

I understand the information above and have had all of my questions answered. I understand that I am encouraged to ask questions, voice concerns or complaints about any aspect of this research study during the course of this study, and that such future questions, concerns or complaints will be answered by a qualified individual or by the investigator(s) listed on the the first page of this consent document at the telephone number(s) given. I understand that I may always request that a listed investigator address my questions, concerns or complaints. I understand that I may contact the Human Subjects Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668) to discuss problems, concerns and questions, obtain information, offer input, or discuss situations in the event that the research team is unavailable. I understand that I may withdraw from this study at any time without negative consequences. I am responsible for returning a copy of this consent form.

___ **YES**, I, _____, agree to participate in the study.
(Instructor name)

_____ _____
Instructor Signature Date

_____
Instructor Name

2. Instructor Contact Information

Instructor Name:_____

Primary Phone Contact:_____

Email Contact:_____

School District Name:_____

School Campus Name:_____

School Phone Number:_____

School Email:_____

Classroom Grade(s):_____

School Mailing Address:_____

_____

_____

_____

APPENDIX E

PLACEMENT CRITERIA FOR ASSESSMENT OF MATH COMPUTATION

Grade	Level	Median digits correct per minute	Median digits incorrect per minute
1-3	Frustrational	0-9	8+
	Instructional	10-19	3-7
	Mastery	20+	≤2
4+	Frustrational	0-19	8+
	Instructional	20-39	3-7
	Mastery	40+	≤2

Note. Adapted from "Behavioral Assessment of Academic Behavior," by E. S. Shapiro and F. E. Lentz, 1986, in T.R. Kratochwill (Ed.), *Advances in School Psychology*, Vol. 5, pp. 87-139, as cited in Academic *Skills Problems* (4th ed.), by E. S. Shapiro, 2004, p.156.

APPENDIX F

DEMOGRAPHIC INFORMATION OF SUSPENDED STUDENT

Student	Skill (Proficiency Level)	Age (yrs.)	Grade	Gender	Race	Primary Disability	Secondary Disability	Reason for Emotional Support Services	Support
Ned	Multiplication (F)	12	6th	M	C	ED	SLD	ODD, physical aggression, noncompliance, truancy	Sensory breaks, Token economy, Wrap-around services

Note. Note. F = frustration; M = male; C = Caucasian; SLD = specific learning disability; ODD = oppositional defiant disorder. Proficiency refers to the performance of participants on math-fact screening probes.

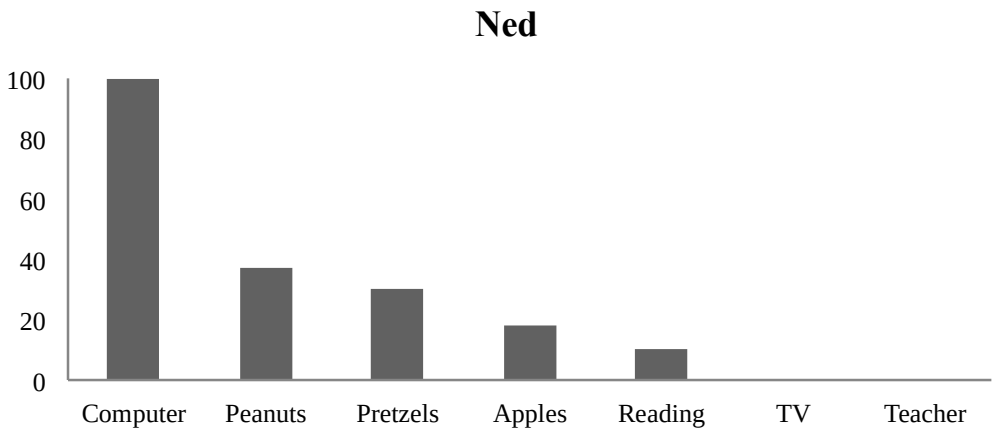
APPENDIX G

VARIABLE RATIO (VR) SCHEDULE OF SUSPENDED STUDENT

Student	Mean Baseline Responses Per Minute	VR
Ned	16.1	18

APPENDIX H

PERCENTAGE OF TRIALS ON WHICH SUSPENDED STUDENT SELECTED AVAILABLE STIMULI DURING THE INITIAL MSWO ASSESSMENT



APPENDIX I

SUSPENDED STUDENT'S PREFERENCE RANKINGS OBTAINED FROM INITIAL VOCAL NOMINATION SESSION

Student	1	2	3	4	5	6	7
Ned	Computer	Pretzels	Reading	Apples	Teacher	Peanuts	TV

APPENDIX J

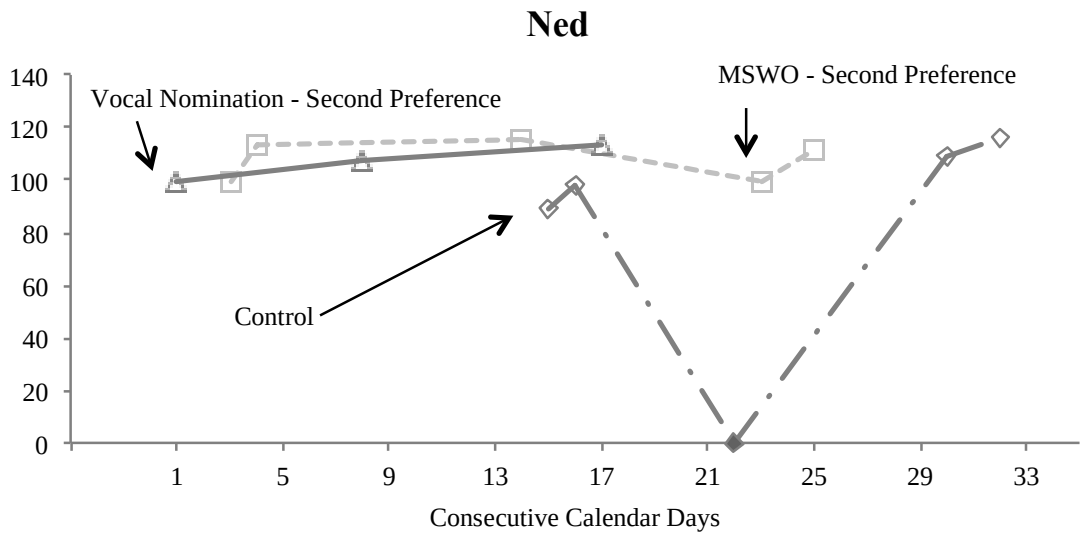
COMPARISON OF SUSPENDED STUDENT'S INITIAL PREFERENCE RANKINGS AND SESSION LENGTH ACROSS VOCAL NOMINATION AND MSWO ASSESSMENTS

ITEM	MSWO (Selection Percentage)	Vocal Nomination
Peanuts	2 (37)	6
Computer	1 (100)	1
Apples	4 (18)	4
Reading	5 (10)	3
Pretzels	3 (30)	2
Teacher	6.5 (0)	5
TV	6.5 (0)	7
Correlation	r_s = .577	
Session Length	7 min 5 s	2 min 48 s

Note. MSWO = multiple-stimulus without replacement; r_s = Spearman correlation. Selection percentages represent number of times student selected item from an array in which item appeared.

APPENDIX K

SUSPENDED STUDENT'S USE OF COMPLETE CCC PROCEDURES PER SESSION; OPEN DATA POINTS REPRESENT FULL SESSIONS; CLOSED DATA POINTS REPRESENT TERMINATED SESSIONS



APPENDIX L

DURATION, TOTAL PERCENT OF POSSIBLE TIME WORKED, PERCENT OF SESSIONS OPTED OUT, AND CUMULATIVE CCC COMPLETION SUSPENDED STUDENT DURING REINFORCER ASSESSMENT

	Ned		
Session	**Control (CD)**	**MSWO (CD)**	**VN (CD)**
1	300 s (15)	300 s (3)	300 s (1)
2	300 s (16)	300 s (4)	300 s (8)
3	3 s (22)	300 s (14)	300 s (17)
4	300 s (30)	300 s (18)	N/A
5	300 s (32)	300 s (23)	N/A
POTENTIAL SESSION TIME	1500 s	1500 s	900 s
PERCENT SESSIONS OPTED OUT	20	0	0
PERCENT POTENTIAL TIME WORKED	80.2	100	100
TOTAL CCC PER CONDITION	412	537	319

Note. CD = calendar day; MSWO = multiple-stimulus without replacement preference assessment; VN = vocal nomination. Duration presented in seconds. Sessions could not exceed 300 seconds. Potential time worked represents a proportion of the cumulative time worked per the total potential length of all sessions within each condition.

APPENDIX M

MATH PROBE PERFORMANCE OF SUSPENDED STUDENT

	Ned	
Probe no.	**DCPM**	**DICPM**
1	8	0.2
2	11	0.2
3	6.6	1.6
4	5.8	1.6
5	6.4	1.6
6	9.2	1.6
Pre-M (SD)	8.53 (1.84)	.67 (.66)
Post-M (SD)	7.13 (1.48)	1.6 (0)

Note. Italicized probes occurred prior to the intervention. DCPM = digits correct per minute; DICPM = digits incorrect per minute.

APPENDIX N

SAMPLE MATH WORKSHEET

Name: Date:

Multiplication Worksheets

3 x3	5 x9	2 x3	6 x6	7 x8
9 x6	6 x6	6 x2	4 x4	4 x2
6 x3	7 x7	6 x6	7 x8	6 x5
6 x3	5 x8	9 x3	4 x8	6 x3

APPENDIX O

COVER-COPY-COMPARE MATHEMATICS SINGLE-SKILL COMPUTATION

STUDENT WORKSHEET

4 x6 24	4 x6
8 x8 64	8 x8
6 x4 24	6 x4
7 x4 28	7 x4
8 x8 64	8 x8

APPENDIX P

RANKED REINFORCEMENT SURVEY

The investigator will administer the RRS in interview format to assess each student's preference for different potential reinforcers. As the investigator reads the list of potential reinforcers, the student will have a typed list of the items to follow along. The investigator will say, "On this sheet are things kids sometimes get in school. I want you to tell me what things you like and would be willing to do work to earn. I will read the three things in each group you can earn while you follow along. You tell me the item from the group you would like and I will circle your choice out of the group." The investigator will place the stimulus list in front of the student, list stimuli from each of the groupings, and record the student's responses. After the student has reviewed the 7 stimuli, the investigator will ask the student to rank his/her preference by saying, "Decide which of the you circled items you would most like to earn and I will put a '1' in the box to the right of that item. Then decide the next item you would most like to earn and I will put a '2' in the box to the right of that item. Do this for your top 4 items.' The investigator will then record the student's rankings. The top ranked stimulus will be chosen as the reinforcer to be used under the student nomination reinforcer assessment condition.

Ranked Reinforcement Survey (RRS)

Participant ID_____

Date_____

	Please circle your choice	Rankings
Group 1	Fruit Free time for art, drawing	
Group 2	Cookies Time watching television	
Group 3	Candy Assisting in class	
Group 4	Crackers Free time for reading	
Group 5	Popcorn Time on computer	
Group 6	Nuts Juice, Drink	
Group 7	Pretzels, Chips Stickers, stars	

Note. Adapted from "Evaluation of Stimulus Preference Assessment Methods with General Education Students," by G. T. Schanding, D. H. Tingstrom, and H. E. Sterling-Turner, 2009, *Psychology in the Schools, 46(2)*, pp. 89-99. Used with permission of the first author.

APPENDIX Q

RANKED REINFORCEMENT SURVEY FIDELITY CHECKLIST

RRS Fidelity Checklist
Student #

Student Survey

Instructions Delivered Prior to Survey	Yes	No	
Instructions Match Scripted Instructions	Yes	No	
Stimuli Choices Read Aloud	Yes	No	
Follow Up Questions on Expansive Categories (e.g., Candy)	Yes	No	
Circled Choices Match Choices of Participant	Yes	No	
Student Ranks Choices	Yes	No	
Teacher Survey			
Form completed and returned from teacher	Yes	No	
Number of "Yes" Selected		/7	x 100 = **PERCENT FIDELITY:**

APPENDIX R

MSWO FIDELITY CHECKLIST

MSWO Fidelity Checklist

Student #:

Timekeeping			
Timer Used	Yes	No	
Student Allowed to Interact with Materials for 30s	Yes	No	
Procedures			
Instruction Consistent with Research Protocol	Yes	No	
All Items Presented in Array for Trial 1	Yes	No	
Order of Items Randomized For Trial 1	Yes	No	
Selected Items Removed from Array 1	Yes	No	
All Items Presented in Array for Trial 2	Yes	No	
Order of Items Randomized For Trial 2	Yes	No	
Selected Items Removed from Array 2	Yes	No	
All Items Presented in Array for Trial 3	Yes	No	
Selected items Removed from Array 3	Yes	No	
Order of Items Randomized fro Trial 3	Yes	No	
Results			
Recorded Correct Order of Selection for Trial 1:			
Item 1	Yes	No	
Item 2	Yes	No	
Item 3	Yes	No	
Item 4	Yes	No	
Recorded Correct Order of Selection for Trial 2:			
Item 1	Yes	No	
Item 2	Yes	No	
Item 3	Yes	No	
Item 4	Yes	No	
Recorded Correct Order of Selection for Trial 3:			
Item 1	Yes	No	
Item 2	Yes	No	
Item 3	Yes	No	
Item 4	Yes	No	
Number of "Yes" Selected		/24	x 100 = **PERCENT FIDELITY:**

APPENDIX S

TREATMENT SESSION FIDELITY CHECKLIST

CCC Session Fidelity Checklist		Date:	
Student #		Treatment Condition:	
Timekeeping			
Timer Used	Yes	No	
Student Stopped with Appropriate time	Yes	No	
Procedures			
Student Informed of Reinforcer Condition	Yes	No	
Correct Reinforcer Condition Observed	Yes	No	
Student Told of Escape Rule	Yes	No	
Reinforcement Administered on a Variable Schedule (if applicable)	Yes	No	N/A
Student Covers Up Academic Stimulus when Writing Answers	Yes	No	
Tutor Monitors use of CCC	Yes	No	
Number of "Yes" Selected		/8 (7)	x 100 = **PERCENT FIDELITY:**

APPENDIX T

TEACHER SOCIAL VALIDITY SURVEY

PART I: DEBRIEFING

This study focused on evaluating the effectiveness of assessments designed to identify incentives that can assist teachers in building appropriate academic for children with ED. The purpose of this project was to determine whether a choice-stimulus preference assessment, whereby children select tangible items (e.g., candy) from an array, more effectively identifies incentives than simply asking the students which items they preferred. These incentives were then used to encourage a child in your classroom to participate in a brief, evidence-based math intervention.

The intervention consisted of three steps: (a) the learner studied an academic task (e.g., a math fact) and its answer, (b) the learner covered the task and provided a response, and (c) the learner compared the attempt to the correct problem. In the event that the attempt made by the learner failed to match the correct answer, the learner repeated the process. The children received access to a small amount preferred item as a reward for participating in the math intervention.

Results of the study were mixed. One student, 001, completed more items when working for the reward identified via the choice-stimulus preference assessment. Students 004 and 005, however, completed the same number of items regardless of which reward they received.

Part II.

Please respond to the following questions:

1. Please indicate the rewards you currently provide to students in your classroom (select all that apply)
   -Edibles (e.g., candy, chips)
   -Tangibles (e.g., pencils)
   -Social (e.g., praise)

-Activities (e.g., time on the computer)

2. Do you consult your students before providing rewards?

Please respond to the following questions using a scale of 1-5 (e.g. 1 being least effective, 5 being most effective).

1. In your opinion, how effective is the use of rewards in increasing the work performance of students? (Likert scale)
2. In your opinion, how *appropriate* is the use of rewards for increasing work performance of students (Likert scale)?
3. Based on the results of the experiment, how likely are you to further incorporate the use of rewards in your classroom? (Likert scale)
4. In your opinion, did the child exhibit a greater degree of cooperation when receiving reinforcement during the experiment?
5. Would you consider using the MSWO to identify rewards for your students?

APPENDIX U

STUDENT SOCIAL VALIDITY SURVEY

Please respond to the following questions using a scale from 1 (strongly disagree) to 5 (strongly agree).

1. I earned rewards that I liked during the experiment.
2. I would work for the rewards that I earned during the experiment.
3. I liked (MSWO reward).
4. I liked (RRS reward).
5. I am more likely to complete assignments if I receive rewards.
6. It does not matter what type of reward I receive for completing assignments.
7. I like being asked what rewards I will receive in class.

APPENDIX V

DIRECT COMPARISON OF PREFERENCE ASSESSMENT RANKS OVER MULTIPLE ADMINISTRATIONS

	Preference Rankings											
	Chris				Frank				Stan			
ITEM	MSWO T1	MSWO T2	VN T1	VN T2	MSWO T1	MSWO T2	VN T1	VN T2	MSWO T1	MSWO T2	VN T1	VN T2
Cookies	100	100	5	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Computer	50	0	1	3	75	100	2	6	22	38	1	3
Apples	20	42	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Juice	18	27	2	6	N/A	N/A	N/A	N/A	8	0	2	1
Stickers	16	8	3	7	N/A	N/A	N/A	N/A	100	100	7	4
Reading	0	0	6	5	16	0	7	7	10	9	6	6
Soda	N/A	N/A	N/A	N/A	43	50	1	1	N/A	N/A	N/A	N/A
Teacher	0	22	7	1	0	0	5	4	27	20	3	2
Chips	N/A	N/A	N/A	N/A	43	30	6	3	N/A	N/A	N/A	N/A
Art	N/A	N/A	N/A	N/A	8	0	4	5	9	8	4	5
TV	N/A	N/A	N/A	N/A	0	27	3	2	10	20	5	7
Correlation	r = .758*		r_s = -.464		r = .886*		r_s = .500		r = .966**		r_s = .643	

Note. MSWO = multiple-stimulus without replacement; VN = vocal nomination; r = Pearson product moment correlation; r_s = Spearman correlation.
*p < .05. **p < .001.

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