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FUNCTIONAL ANALYSIS IN PUBLIC SCHOOLS: A SUMMARY OF 90 FUNCTIONAL ANALYSES

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Several review and epidemiological studies have been conducted over recent years to inform behavior analysts of functional analysis outcomes. None to date have closely examined demographic and clinical data for functional analyses conducted exclusively in public school settings. The current paper presents a data-based summary of 90 functional analyses conducted in public school settings from 2006 through 2009 for 69 students. Specifically, we present data on gender, age, race, diagnosis, topography of target behaviors, number of conditions, duration of sessions, duration of analysis, functional outcomes, setting, and person serving the role of therapist. Results suggest that functional analyses in schools are possible, practical, and produce results that are comparable to those in past research.

Key words: functional analysis, public schools, severe problem behavior

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Functional analysis is a functional assessment methodology in which discriminative stimuli, motivating operations (MO), and potential reinforcers for a target behavior are carefully arranged in a controlled manner to elucidate and isolate the effects of potential sources of reinforcement (e.g, Carr & Durand, 1985; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Typically, these variables are confounded when behavior is observed but not experimentally manipulated (Iwata, Kahng, Wallace, & Lindberg, 2000; Mace, Lalli, & Lalli, 1991). Functional analysis is the only functional behavioral assessment (FBA) methodology that can lead to *functional* rather than *correlational* outcome data with respect to the relations between environmental events and problem behavior (Asmus, Vollmer, & Borrero, 2002; Cooper, Heron, & Heward, 2007; Mueller, 2004). Since the development of functional analysis methods by Iwata et al. (1982/1994), hundreds of papers have been published supporting its use with students and adults in home, clinic, school, and residential settings (e.g., Hanley, Iwata, & McCord, 2003). Functional analyses have been conducted on nonsevere behaviors such as noncompliance and classroom disruption (Broussard & Northup, 1995; Wilder, Harris, Reagan, & Rasey, 2007) and on very severe problem behavior such as self-injurious behavior (SIB; McCord, Thomson, & Iwata, 2001) aggression (O'Reilly, 1995), and property destruction (Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998).

Some reviews of functional analysis outcomes have provided descriptive data on several variables. For example, Iwata et al. (1994) summarized functional analysis outcomes for 152 individuals who engaged in SIB. All analyses were conducted in residential facilities or group homes over an 11-year period. The majority of functional analyses (95.4%) produced differential responding and, therefore, useable results for treatment planning. Negative reinforcement in the form of escape from tasks or other aversive sources of stimulation was identified as the maintaining variable most often (38.1%). Social-positive reinforcement, in the form of attention or access to tangible items, accounted for 26.3% of the identified functions for SIB. Automatic reinforcement was found to maintain 25.7% of the cases. About 5% of functional analyses suggested multiple control. In a systematic extension of Iwata et al., Kurtz et al. (2003) reviewed functional analysis

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outcomes for 23 children under the age of 5 years who had been referred for treatment of SIB and other severe behaviors. All functional analyses were conducted in a university clinic setting, and a caregiver served the role of therapist for 70% of the analyses. Functional analyses identified 87.5% of the referred behaviors' maintaining variables. Unlike the findings of Iwata et al., negative reinforcement was responsible for maintaining only 3.4% of the individuals' SIB, and positive reinforcement (i.e., attention, tangible, attention plus tangible) accounted for 37.9% of the cases.

Hanley et al. (2003) conducted a review of functional analysis outcomes published in peer-reviewed behavior analysis journals. Similar to Iwata et. al. (1994), Hanley et al. found that 34.2% of behaviors were maintained by negative reinforcement, 25.3% were maintained by attention, and 10.1% was maintained by access to tangible items. In a departure from previous reports, Hanley et al. found that 31% of published functional analyses were conducted in school settings. However, participant demographics and functional analysis outcome data were not reported separately for the school-based analyses.

Evaluation of functional analysis outcomes from public schools only is needed to help to ascertain whether functional analysis methods can identify the reinforcers for problem classroom behaviors and whether the functional analysis process is practical in a public school environment. Given the myriad differences between public schools and other settings, functional analysis outcome data might differ from those reported previously due to differences in settings, student demographics, and topographies of referral. The purpose of the present study was to examine demographic and clinical outcome data for 69 students whose behaviors led to 90 functional analyses that were conducted in public school settings.

METHOD

Participants and Settings

All participants were public school students who had been referred for intensive behavior-analytic consultation services from 2006 to 2009. All referrals were made from public schools in the Atlanta, Georgia, metro area by public school administrators who sought consultation regarding individual students who demonstrated severe problem behavior.

The primary location of each analysis was the classroom, therapy room, conference room, office, or library. If an analysis took place in a classroom, an area in the classroom typically was partitioned off to protect against the influence of uncontrolled variables. The case manager made location determinations based on severity and disruptiveness of the problem behavior, classroom layout, and descriptive assessment information relative to whether or not classroom variables affected the behavior. Classroom use always was considered first. Other options were considered if the classroom was ruled out due to concerns about safety or threats to experimental control.

The person who served the role of therapist was a consultant, teacher, paraprofessional, or school district behavior specialist. All consultants were master's- or doctoral-level behavior analysts. The case manager determined who served the role of therapist based on several factors. Teachers always were considered first. However, other personnel were chosen if the behavior was deemed too dangerous (e.g., aggression), if the teacher could not take time away from other students, or if the teacher or paraprofessional did not feel comfortable serving as therapist. In some cases, teacher training for the role of therapist was terminated prematurely when it was apparent that more extensive training would be needed. Finally, even though this is subjective, if the case manager felt that rapport with a teacher might be affected negatively by the training process, someone other than the teacher was selected to serve as therapist.

General Procedure

During the 3-year period, 69 students who ranged in age from 4 to 21 years ($M = 11.6$ years) had been referred for assessment and treatment of severe destructive behaviors. Multiple functional analyses had been conducted with 17 of the students, resulting in a total of 90 analyses. When multiple analyses were conducted with a single student, different topographies of behavior were evaluated in separate analyses. The functional analyses included in this review were conducted as part of the Behavior Analytic Consultation to Schools model (BACS; Mueller & Nkosi, 2007, 2009). The BACS is a behavior-analytic service delivery model used in the assessment and treatment of severe problem behavior in school settings. The BACS model begins with record review, parent and teacher interviews (e.g., Functional Assessment Informant Record for Teachers; Doggett, Mueller, & Moore, 2002; Edwards, 2002), and rating scales (e.g., Motivation Assessment Scale; Durand & Crimmins, 1988). Next, we conduct direct observations in the classroom using narrative observation methods, antecedent–behavior–consequence recording (Bijou, Peterson, & Ault, 1968), and scatterplot recording (e.g., Touchette, MacDonald, & Langer, 1985). Results of these indirect and descriptive assessments lead to the development of specific hypotheses regarding the functions of the target behavior. These hypotheses are then tested in the functional analysis.

The individualized nature of the analyses allows test conditions to be included only when descriptive data suggest that a condition has a high probability of containing a maintaining variable. Similarly, when descriptive data do not support the inclusion of a condition, those conditions are excluded from the analysis (Mueller & Nkosi, 2009). These two guiding principles ensure that the fewest number of conditions are included in the analysis to minimize assessment time, disruption to the student's schedule, and disruption of the peers' learning environment. The logic of each functional analysis condition is based on that described by Iwata et al. (1982/1994). To test for positive reinforcement, some variable is either withheld (e.g., attention) or restricted (e.g., tangible items) and then is made available only for a brief period following occurrences of the target behavior. To test for negative reinforcement, some presumably aversive variable is presented (e.g., academic demands) and is terminated only briefly following the target behavior. The test for automatic reinforcement consists of an ignore condition because secure and safe rooms are not available to conduct an alone condition. All functional analyses were conducted using multielement designs. Analyses were concluded when two or three data points of any test condition clearly were differentiated above the control condition. Decisions to end analyses were made via visual inspection of the data by the behavior-analytic consultant who managed the case or during individual or group supervision of consultants by doctoral-level behavior analysts.

Session length ranged from 2 to 30 min, as determined by the consultant. Five-minute sessions were used most often. Our general approach was to use 5-min sessions to minimize analysis time, school disruption, and intentional reinforcement of problem behavior. If little or no behavior was observed after conducting two to three series of conditions with 5-min sessions, the session length was increased to 10 min. Session length was just 2 min in one analysis due to time constraints. Thirty-minute sessions were used for extended ignore sessions only. Extended ignore sessions were conducted to determine if high levels of behavior observed in an ignore session would be extinguished over time.

Data collection. Doctoral- or master's-level behavior analysts, students under Board Certified Behavior Analyst certification supervision, predoctoral practicum students, or predoctoral interns served as data collectors. Data collectors used either a count (i.e., number of responses) or a 10-s partial-interval recording system. Functional analysis results were calculated either as rate (responses per minute) or as percentage of intervals. To generate a rate measure, the number of responses of the target behavior was divided by the number of minutes in the session. To generate a percentage-of-intervals measure, intervals with target behaviors were summed and divided by the total number of 10-s intervals in the session. For the purposes of this review, demographic and clinical data were compiled for each student and each functional analysis. Student demographic information included the age, race, gender, and primary diagnosis of the 69 students. Clinical variables included the number of different conditions in an analysis, duration of sessions, number of sessions, duration of analysis, setting, person serving as therapist, response topography, and functional outcome for the 90 functional analyses. The results of the functional analyses were examined by comparing each series to the control condition. The specific functional outcomes were categorized as attention, escape, access, tangible, automatic, a combination of any of the above, or little or no responding.

Safety and ethical information. The behavior-analytic consultant obtained informed consent from parents for all assessments. Informed consent described the risks of reinforcing problem behavior and the potential benefit of obtaining such information. School administrators always were aware of the procedures and the potential risks for disruption to other classrooms or student learning. All persons who served as therapists were provided with individualized training on physical management procedures relevant to the response topography of the referral. For example, if a referral was to assess aggression in the form of biting, the therapist was taught how to block bites, how to react safely to bites, and how to interact safely with the student (e.g., how to position therapist's body safely when delivering demands). Therapists occasionally sustained superficial injuries (e.g., small scratches, redness of the skin, light bruising) during some analyses. The therapist used protective padding to cover exposed areas of concern during any analysis in which descriptive data suggested a student might engage in SIB (e.g., head banging or hitting a wall, floor, table, etc.). Pads were obtained from the classroom or from the gymnasium through coordination with the physical education teacher. Subjective session-termination criteria were established for some students to establish when a session would be terminated if the response frequency or magnitude in a session was elevated above what typically was observed in the referral environment. However, no sessions were terminated due to response severity, frequency, or magnitude.

Condition Types

Social-positive reinforcement. Tests for positive reinforcement included attention, diverted attention, tangible items, and access (interrupt). In the attention condition, procedures were similar to those described by Iwata et al. (1982/1994) in which brief therapist attention was delivered contingent on the target behavior. In the diverted attention condition, the therapist delivered high levels of attention to the student for 1 min prior to the start of the session. The session began when the therapist stopped delivering attention to the student and began delivering high levels of attention to a peer. Target behavior briefly diverted the attention from the peer back to the student. The quality of attention delivered was similar to that delivered in the attention condition and included such statements as, "You can't do that," or "No hitting." After attention was delivered to the student, attention was delivered back to the peer. In the tangible condition, procedures followed those described by Fisher et al. (1993) in which access to a preferred tangible item was restricted and then returned briefly contingent on the target behavior. During the access (interrupt) conditions (see Hagopian, Bruzek, Bowman, & Jennett, 2007), several preferred items were distributed throughout the room. The therapist initiated the session after the student began to engage with an object. At fixed intervals, the student was interrupted verbally and physically from the activity and told to do something else (e.g., "You can't play with that right now; find something else to do."). The student was allowed to access previously interrupted activities but was restricted from the activity most recently interrupted. If a target behavior occurred, the therapist allowed the student access to the most recently interrupted activity for a brief period. Following this brief access, the therapist again initiated the fixed-time interruptions.

Social-negative reinforcement. The escape from academic demand condition followed procedures described by Iwata et al. (1982/1994). Difficult or nonpreferred academic demands were delivered using a three-step (verbal, gestural, physical) prompting procedure. Contingent on the target behavior, the therapist removed academic demands and turned away for a brief period. At the end of the reinforcement interval, a new demand was delivered.

Automatic reinforcement. No programmed consequences were delivered for the target behavior. No therapist interaction occurred with the student during the session.

Control conditions. During the control conditions, the student was provided with noncontingent access to the reinforcers that were included in the test conditions. For example, if an attention and a tangible condition were included in the analysis, noncontingent attention and tangible items were provided in the control condition. If a tangible and an escape condition were included in an analysis, no demands and noncontingent tangible items were included in the control condition. No programmed consequences were delivered for target behaviors. Depending on which test conditions were included in the analysis, these conditions provided a control for contingent access to tangible items, attention, adult proximity, escape from demands, and location.

Interobserver Agreement

Two different forms of interobserver agreement data were collected during the study. First, two observers collected data independently for 100% of sessions during 31 of the 90 (34%) functional analyses. For sessions that recorded frequency data, interobserver agreement was calculated by dividing the lower count by the higher count and multiplying by 100%. For sessions in which interval data were collected, agreement was calculated by dividing the number of intervals of exact agreement between observers by the number of observed intervals and multiplying by 100%. The range of agreement between observers was 86% to 100% ($M = 96\%$). The second type of interobserver agreement was determined after the analyses were completed. Five master's- and doctoral-level behavior analysts visually inspected 60 of the 90 (67%) functional analyses. Each behavior analyst was asked to categorize the graph by behavioral function. The percentage of the 60 graphs in which there was consensus agreement (all five behavior analysts needed the same results to be coded as a consensus agreement) was divided by the total number of graphs displayed (i.e., 60) to determine the percentage agreement. Consensus agreement was reached for all of the graphs inspected.

RESULTS

The top panel of Table 1 depicts the American Psychiatric Association (2000) or Georgia special education eligibility category for students receiving special education services who were not medically diagnosed. Of the 69 students, 47 (68%) had been diagnosed with autistic disorder. Including individuals diagnosed with Asperger's disorder and pervasive developmental disorder not otherwise specified (PDD-NOS), 83% of the students were diagnosed with a PDD. Table 1 also depicts the age of participants in 2-year groups and their racial makeup and gender. Eighty-seven percent were between the ages of 5 and 12 years; 72% were Caucasian, and 26% were African-American; 80% were male, and 20% were female.

Table 2 depicts the number and percentage of the sample of functional analyses conducted for each response topography. Of the 90

Table 1
Student Characteristics

		Number of students	Percentage of sample
Diagnosis	autism	47	68
	PDD-NOS	5	7
	Asperger	5	7
	ADHD	4	6
	EBD	2	3
	Down	2	3
	FAS	1	1
	bipolar	1	1
	Landau-Klefner	1	1
	MR	1	1
Age (years)	1 to 2	0	0
	3 to 4	5	7
	5 to 6	13	19
	7 to 8	16	23
	9 to 10	16	23
	11 to 12	8	12
	13 to 14	6	9
	15 to 16	3	4
	17 to 18	1	1
	19 to 20	0	0
	21 and over	1	1
Race	Caucasian	50	72
	African-American	18	26
	Asian-American	1	1
Gender	female	14	20
	male	55	80

Note. Student demographic information summary for 69 students whose behaviors were analyzed. PDD-NOS = pervasive developmental disorder, not otherwise specified; ADHD = attention deficit hyperactivity disorder; EBD = emotional and behavioral disorder; FAS = fetal alcohol syndrome; MR = mental retardation.

Table 2
Topography

	Number of analyses	Percentage of sample
Aggression	42	47
SIB	8	9
Tantrum	8	9
Property destruction	8	9
Aggression with property destruction	8	9
Disruption	5	6
Vocalizations	3	3
Flopping	2	2
Screaming	2	2
Aggression or SIB	1	1
Mouthing	1	1
Touching	1	1
Aggression or screaming	1	1

functional analyses, 47% targeted aggression. SIB, tantrums, property destruction, and aggression with property destruction each comprised 9% of the analyses. The remainder of the topographies consisted of disruption, vocalizations, flopping, screaming, aggression with SIB, mouthing, touching, and aggression with screaming (for a total of 17% of the sample).

Sixty-one percent of the functional analyses were conducted in the student's classroom. The next most frequent location (29%) was a separate therapy room. Other settings included conference rooms, school offices, utility rooms, libraries, and teacher lounges. A trained behavioral consultant served as therapist in 80% of the functional analyses. Teachers, trained by the consultant, served as therapist in 16% of the analyses. A school system behavior specialist or paraprofessional served as therapist in the remaining 4% of analyses.

Each functional analysis included two to six of the following conditions: attention, tangible, escape, interrupt, diverted attention, or control (Table 3). Forty-nine percent of the functional analyses were conducted using four different conditions, and 83% were conducted using 5-min sessions. We increased the duration of sessions from 5 min to 10 min for 11% of the analyses. Only 3% of the analyses were conducted solely using 10-min sessions. Table 3 also depicts the distribution of functional analysis durations in 30-min groups. Duration of an analysis was computed by multiplying the duration of each session by the number of sessions conducted at that duration (e.g., 20 sessions × 5 min = 100 min), and excluding the 3- to 5-min breaks between sessions. The functional analyses ranged from 30 min to 430 min (M = 109 min). Thirty-three percent fell in the 30- to 60-min range, which was the most frequent duration. Fifty-eight percent of the analyses were conducted in 90 min or less, 71% were conducted in 120 min or less, and 83% were conducted in 180 min or less.

Table 4 depicts the number and percentage of each specific and general reinforcer identified in the functional analyses. Escape from task

Table 3
Length and Duration of Functional Analyses

		Number of analyses	Percentage of sample
Number of conditions	6	7	8
	5	25	28
	4	44	49
	3	13	14
	2	1	1
Duration of sessions	2 min	1	1
	5 min	75	83
	10 min	3	3
	increase 5 to 10 min	10	11
	increase 5 to 30 min	1	1
Duration of analysis	0 to 30 min	4	4
	31 to 60 min	30	33
	61 to 90 min	18	20
	91 to 120 min	12	13
	121 to 150 min	9	10
	151 to 180 min	2	2
	181 to 210 min	4	4
	211 to 240 min	5	6
	241 to 270 min	3	3
	300 + min	3	3

demands was the highest percentage of identified reinforcers (26%) for target behaviors, followed by attention (16%), access to interrupted activities (13%) or tangible items (11%), and automatic reinforcement (4%). Seven percent of the analyses produced little or no responding, and 3% were undifferentiated (i.e., a function could not be identified using visual inspection of the graph). For more general classes of reinforcers, 51% of the analyses identified positive reinforcement as the function of the target behavior. Twenty-six percent

Table 4
Identified Reinforcers

		Number of analyses	Percentage of sample
Specific reinforcer	escape	23	26
	attention	14	16
	access	12	13
	tangible	10	11
	attention and tangible	8	9
	little or no responding	6	7
	automatic	4	4
	attention and escape	4	4
	undifferentiated	3	3
	escape and tangible	2	2
	access and tangible	1	1
	escape and access	1	1
	escape, attention, and tangible	1	1
	tangible and interrupt	1	1
General reinforcer	positive reinforcement	46	51
	negative reinforcement	23	26
	combined	8	9
	automatic	4	4
	not identified	9	10

Note. Top panel presents the number and percentage of specific reinforcers identified in the 90 functional analyses. Bottom panel depicts the specific reinforcers grouped into general reinforcers presented as the number and percentage of the 90 analyses.

Table 5
Functional Outcome by Response Topography

	Undiff or little or no responding	Diff	Esc	Atten	Acc	Tang	Auto	Mult
Aggression	7	35	12 (35)	4 (11)	3 (9)	4 (11)	0 (0)	12 (34)
Self-injury	0	8	2 (25)	0 (0)	2 (25)	1 (13)	1 (13)	2 (25)
Tantrum	0	8	1 (13)	2 (25)	0 (0)	3 (38)	0 (0)	2 (25)
Property destruction	1	7	2 (29)	1 (14)	3 (43)	1 (14)	0 (0)	0 (0)
Aggression and property destruction	1	7	3 (43)	0 (0)	2 (29)	0 (0)	0 (0)	2 (29)
Disruptions	0	5	0 (0)	4 (80)	1 (20)	0 (0)	0 (0)	0 (0)
Vocalizations	0	3	0 (0)	1 (33)	0 (0)	1 (33)	1 (33)	0 (0)
Flopping	0	2	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Scream	0	2	0 (0)	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)
Aggression and SIB	0	1	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mouthing	0	1	0 (0)	0 (0)	0 (0)	0 (0)	1 (33)	0 (0)
Touching	0	1	0 (0)	0 (0)	0 (0)	0 (0)	1 (33)	0 (0)
Aggression and scream	0	1	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Total	9 (10)	81 (90)	23 (26)	14 (16)	12 (13)	10 (11)	4 (4)	18 (20)

Note. For each topography, the number of analyses that showed differentiated outcomes or undifferentiated (including little or no responding) outcomes is provided. The number of functional analyses, by topography, that identified specific reinforcers is shown. Percentage of the functional analyses, by topography, from those that were differentiated is presented in parentheses. Heading abbreviations: Undiff = undifferentiated; Diff = differentiated; Esc = escape; Atten = attention; Acc = access; Auto = automatic; Mult = multiple.

identified negative reinforcement, and the remainder identified functions as either automatic reinforcement (4%) or combined positive and negative reinforcement (9%).

Table 5 provides functional outcome data by response topography. The most frequent problem behavior was aggression. Of the 42 analyses for aggression, 35 resulted in differentiated outcomes. Escape (35%) was the predominant maintaining variable for aggression. However, multiple maintaining variables were identified in 34% of the analyses for aggression. All eight of the analyses for SIB resulted in differentiated outcomes. Escape, access to interrupted activities, and multiple forms each were identified as the maintaining reinforcer in 25% of the analyses. Access to tangible items was found to maintain tantrums in 38% of the analyses that targeted that behavior.

DISCUSSION

The manipulation of common environmental variables that occasion, evoke, and maintain problem behavior produced the identification of maintaining variables in 90% of functional analyses conducted in school settings. Similarly high levels of differentiated outcomes have been reported in previous research (e.g., Asmus et al., 2004; Derby et al., 1992; Hanley et al., 2003; Iwata et al., 1994; Wacker et al., 1998). Of particular interest in the present findings was the short duration needed to reach differentiated outcomes. The length of time required to complete functional analyses is frequently cited as the reason they are not practical in applied settings (e.g., Gresham, Quinn, & Restori, 1998; Hayes & Follette, 1993; Haynes, 1998; Haynes & O'Brien, 1990; LaRue, Weiss, & Ferraioli, 2007; Lerman & Iwata, 1993; Miller, Tansy, & Hughes, 1998; Noell & Witt, 1998; Repp & Horner, 1999). Results of the present study showed that more than 70% of the functional analyses were completed in 2 hr or less and more than 80% of the analyses were concluded within 3 hr. The functional analysis itself was one of the least time-consuming aspects of the functional assessment process, given the length of time behavior analysts spent directly observing behavior in classrooms, interviewing staff, and reviewing records to develop hypotheses about behavioral function. More than 80% of the analyses were conducted with 5-min sessions, which helped to minimize the total duration of the analyses. Iwata et al. (1994) reported average durations of around 6 hr for their analyses with 15-min sessions. Asmus et al. (2004) reported an average duration of about 4 hr using 5-min sessions. Because previous research suggests shorter session durations may yield reliable data (Hanley et al., 2003; Wallace & Iwata, 1999), arranging 5-min sessions in a public school setting seems ideal to minimize classroom disruption. Session time may be increased if compelling descriptive data suggest that more time might be needed to create the MO for the condition. For example, conditions might be extended beyond the recommended 5-min length if a teacher reports that the student typically tolerates being left alone for short periods of time, or if a student can work satisfactorily for 6 or 7 min.

The BACS model of consultation was used to guide the consultants' movement through a series of best practice steps from initial referral through the functional analyses presented here. Thus, functional analyses were conducted after indirect and descriptive assessments. The functional analyses may have required more sessions or produced different outcomes without the information gained in the descriptive phases. However, the analysis time, whether a function of the other methods that preceded them or not, was short in the great majority of cases. Anecdotally, the longer the analyses took to complete, the less clear were the results.

Kurtz et al. (2003) suggested that younger children most likely encounter fewer demands during their day, which can help to explain why the SIB of younger children is not maintained by escape at levels comparable to older children. In Kurtz et al., a small minority of target behaviors (i.e., about 3%) was maintained by escape. The functional analyses in the current study all were conducted in school settings with school-aged students. School settings most likely produce more demands than other settings do, so negative reinforcement might be a potent reinforcer for dangerous behaviors. The highest percentage of problem behaviors in the current study was reinforced by escape. These findings are consistent with those of Iwata et al. (1994) and Hanley et al. (2003).

Very few behaviors (4%) in the present study were shown to be maintained by automatic reinforcement. This finding is in sharp contrast to those of Iwata et al. (1994), Hanley et al. (2003), and Kurtz et al. (2003), who found that 19.7%, 15.8%, and 13.8% of behaviors, respectively, were maintained by automatic reinforcement. This most likely is due to two related variables. First, very few of the commonly reported stereotypic behaviors were targeted in the present study (e.g., hand flapping, eye gouging, pica, rocking, mouthing, sucking). Second, aggression was the most common targeted behavior in the present study. Aggression very rarely, if ever, has been found to be maintained by automatic reinforcement (see Thompson, Fisher, Piazza, & Kuhn, 1998).

Functional outcomes also varied by topography in the present study. For example, all of the screaming and disruption targeted in functional analyses were maintained by positive reinforcement. All flopping was maintained by negative reinforcement. Mouthing and touching were, in the two cases in which they were targeted, each maintained by automatic reinforcement. The significance of these differences is unknown, given the unequal sample sizes of the referrals made to each category. However, results are consistent with those reported by Hanley et al. (2003).

More than 60% of the functional analyses were conducted in the students' regular classroom setting. All others were conducted outside the classroom in some other unused space converted into an analysis area. Decisions to conduct analyses outside the student's classroom were influenced most by the disruptiveness of the behavior, safety concerns, and potential threats to experimental control (e.g., classroom materials that could not be removed).

Location of the assessment affects both the ecological validity and experimental control of school-based functional analyses. Ecological validity is the extent to which the referral environment mirrors the assessment environment (Brewer, 2000). On the other hand, experimental control is the extent to which the experimenters can control the delivery of the reinforcers and minimize confounding environmental factors (Cooper et. al., 2007). Ecological validity and experimental control may be seen as existing at opposite ends of a continuum. Modifying the environment to ensure greater experimental control results in less ecological validity. Ecological validity is important, because the physical properties (e.g., sights and sounds) and social interactions in a classroom very well may function as MOs related to the reinforcers tested in the analysis. Using 5-min sessions requires high experimental control because of the impact that any event might have on responding.

Diagnostic differences between the individuals in the present and other studies are noteworthy. Only 20% of the individuals had been diagnosed with autistic disorder in Hanley et al. (2003), whereas more than 80% of the students in the present study had been diagnosed with a PDD. The population of students with PDDs is increasing. These students often present clinically with difficulties when exposed to events that are common in school settings. For example, frequent schedule changes and transitions are common antecedent events for problem behavior maintained by access to ongoing activities. Novel and difficult task demands are antecedent events that often precede escape-maintained behavior.

Several limitations of the present study should be noted. First, the extent to which the results can be generalized to students and schools in other geographical areas is unknown, because all the analyses were conducted in Georgia. Student demographic variables and referral topographies might vary greatly from state to state or region to region based on differences in local special education practices, prevalence of certain disorders, in-house staffing of behavior analysts by school districts, and other variables that produce referrals for outside consultation. The high percentage of students with autistic disorder and other PDDs in the present study might limit the generality of results to groups comprised of different populations. Similarly, the predominant referral topography was aggression. Samples with different topographies might yield different functional outcomes.

Another noteworthy limitation concerns the atypical manner in which interobserver agreement data were collected. In most published research, observations are distributed across participants so that some level of agreement is collected for each participant. In the present study, data were collected in every session during 34% of the analyses, and no data were collected during 66% of the analyses. The overall percentage of sessions with interobserver agreement data is consistent with accepted standards for publication, although the distribution of the observations was very much unbalanced. This unequal distribution of data was due to the unavailability of additional staff during some of the consultation sessions. Most commonly, a behavior-analytic consultant managed a referral with no help from other consultants. Precedent for variations in typical interobserver agreement data-collection procedures, including studies in which no data were collected during in vivo consultation, can be found in the school psychology literature (e.g., Ajchenbaum & Reynolds, 1981; Galloway & Sheridan, 1994; Kratochwill, VanSomeren, & Sheridan, 1989; Mueller, Moore, & Sterling-Turner, 2005; Sheridan, Kratochwill, & Elliott, 1990; Witt, Noell, LaFleur, & Mortenson, 1997). However, future researchers and clinicians should pay close attention to the extent to which limited interobserver agreement data threaten the validity of assessment results.

Future research might address many issues noted as limitations above. To what extent do regional differences affect school referrals by student demographic data such as diagnosis? Are there differences in referred behavioral topography by geography, diagnosis, or other variables? Further, given the emerging trend in which functional analysis outcomes vary by response topography, are these differences stable when equal numbers of analyses are compared?

Finally, no treatment data were presented in the summary. In many instances, referrals were made only for the FBA. In these situations, FBAs were conducted, results were discussed at a meeting at which treatment recommendations were offered, and no further services were requested. In many other cases, teachers or other staff were trained on treatments derived from the results, but our own data recording was limited to inconsistent monitoring of teacher implementation. In summary, we conducted 90 functional analyses for 69 students in public schools and reported on several demographic and clinical variables. The present results support previous studies that demonstrate that the most rigorous experimental method at the disposal of behavior analysts, functional analysis, leads to identification of maintaining reinforcers for dangerous behaviors in public schools.

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