A COMPARISON OF SMALL- AND LARGE-GROUP DEPENDENT GROUP CONTINGENCIES

by

DAN R MANGUM

(Under the Direction of Joel E. Ringdahl)

ABSTRACT

Problem behavior during hallway transitions are likely for several reasons: (a) students are in closer proximity of each other, (b) teacher monitoring of students is more difficult and/or (c) there are fewer competing behavior options that have been reinforced (Myerson & Hale, 1984). The current study compared the effects of small- and large-group dependent group contingencies on problem behavior during hallway transitions. The results of the study produced equivocal findings with respect to the impact of group contingencies. Specifically, large-group dependent group contingencies did not result in lower levels of problem behavior relative to the baseline condition of the intervention phase, while small-group dependent group contingencies did result in lower levels of problem behavior relative to the baseline condition of intervention. Additionally, the results indicated that the small-group dependent group contingency clearly resulted in reduced problem behavior relative to the large-group dependent group contingency for two classes. Implications and future research are discussed

INDEX WORDS: Dependent Group Contingency; Hallway Transition Behavior

A COMPARISON OF SMALL- AND LARGE-GROUP DEPENDENT GROUP CONTINGENCIES TO DECREASE PROBLEM BEHAVIOR DURING HALLWAY TRANSITIONS

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DEDICATION

I dedicate this dissertation first and foremost to my wife, Katie. I could not have accomplished this without your unwavering support. You make me a better person every day of my life. I

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CHAPTER 1

INTRODUCTION

Teachers are responsible for, among many other duties, managing the behavior and learning of large numbers of students. According to the United States Department of Education National Center for Education Statistics (2011), class size in primary, middle, and high schools averaged 21.6, 16.7, and 17.7 students in self-contained classrooms and 26.2, 25.5, and 24.2 students in departmentalized instruction, respectively. In an average school, nearly 25% of students engage in some level of problem behavior (Todd et al., 1999). An estimated 1%-5% of students display highly disruptive behavior that interferes with their own learning, the learning of others, and the overall school climate (Sugai et al., 2002). Students exhibiting challenging behaviors may result in interruptions to instruction, which negatively impacts students' ability to learn (Cameron et al., 2008), necessitating a clear need for evidence-based classroom interventions.

School administrators commonly relied on exclusionary practices in the 1980s and 1990s. They regularly removed students exhibiting challenging behavior from their typical educational setting via suspension or expulsion (Notelmeyer & Mcloughlin, 2010). Despite scant evidence to suggest these exclusionary practices improved school climate or student behavior (Skiba et al., 2011), the rate at which school personnel (teachers, administrators, etc.) excluded students from educational settings as a response to problem behavior doubled in a 40-year span (Losen et al., 2015). This increased practice disproportionately affected students with disabilities and those of African American and Latino descent. Losen et al. (2015) found that,

across the United States, suspension rates for African-American students increased from 6 to 16% when comparing the 1972-1973 and 2011-2012 school years, respectively. When comparing the same two academic years (i.e., 1972-73 and 2011-12), suspension rates for Latino students increased from 3% to 7%. Further, in the 2013-2014 school year, students with disabilities comprised approximately 14% of the student population but accounted for approximately 24% of out-of-school suspensions (Office of Civil Rights Data Collection, 2014).

In 1997 Congress reauthorized the Individuals with Disabilities Education Act (IDEA). Provisions within the act required schools using federal funds to include supports for students with disabilities through teaching and reinforcing appropriate behavior (IDEA, 20 U.S.C. § 1414(d)(3)(B)(i)). These proactive supports can and should be written into special education students' Individual Education Plans (IEP). Although these strategies were originally intended for students protected under IDEA, one approach to these types of proactive supports, Positive Behavioral Interventions and Supports (PBIS), has moved into a school-wide intervention framework. This framework utilizes a multi-tiered systems of support (MTSS) service delivery model (Kilgus & Von Der Embse, 2019).

Tier I of PBIS entails universal preventions for problem behavior through establishing consistent, predictable learning environments and high-quality instruction (Sugai et al., 2000). Further, Tier I of PBIS requires teachers to explicitly define, teach, practice, and reinforce classroom rules and routines (Simonsen et al., 2015). Implementation of these strategies should occur across classroom and non-classroom settings, such as the library, cafeteria, playground, and hallways during transitions. For example, implementation of Tier I PBIS related to hallway behavior would include instructions and feedback. Specifically, students would be provided with instructions to walk in a straight line on the right side of the hallway, remain quiet (not speaking

above a whisper), and to keep their hands to themselves. During the transitions, students would also be provided with performance feedback regarding desired behavior, as a critical feature of Tier I is the reinforcement of expected behaviors (Simonsen et al., 2008).

Tier I PBIS preventative supports result in approximately 80% of students exhibiting appropriate behavior (Walker et al., 1996). Within a multi-tiered system, such as school-wide positive behavioral interventions and supports (SWPBIS), students not responding at one level, receive increasingly intensive and targeted interventions (Fienberg & Vanlone, 2019). Tier II supports are generally conceptualized as targeted group interventions (Campbell et al., 2019). Although the methods used and skills targeted might differ across interventions, all Tier II interventions should include several critical features, including: (a) explicit teaching of expected behaviors, (b) increased opportunities for feedback, (c) efficient and cost-effective supports, and (d) increased structure and predictability (Anderson & Borgmeier, 2010; Hawken et al., 2009). Examples of successful Tier II interventions include check-in, check-out (CICO; Wolfe et al., 2016), self-monitoring (Briesch, & Briesch 2016), peer management (e.g., Flood et al., 2002; Grauvogel-MacAleese & Wallace, 2010), and group contingencies (e.g., Barrish et al., 1969; Radley et al., 2016; Morrison & Jones, 2007). Of these interventions, group contingencies pose a practical benefit for researchers and practitioners when developing interventions applied to multiple students within a classroom who engage in elevated levels of problem behavior (Cooper, et al., 2007; Litow & Pumroy, 1975; Theodore et al., 2004).

Cooper et al. (2019) define group contingencies as a common consequence (typically a reward intended to function as reinforcement) that is accessed contingent upon the behavior exhibited by one member, some members, or all members of a group. In their meta-analysis of interventions targeting disruptive behavior, Stage and Quiroz (1997) found that group

contingencies had the largest mean effect size when compared with other interventions such as token economies, differential reinforcement, peer management, and response cost procedures.

Barrish et al. (1969) provided one of the first evaluations of the effects of a group contingency on class-wide disruptive behaviors. Barrish et al. conducted their study in a general education fourth-grade classroom with 24 students. Seven of the students in the classroom had been referred to the principal more than once for problem behavior including disruption (which the authors equated with "talking out") and out-of-seat behavior. This study provided a description of the original version of the good behavior game (GBG; a group-contingency based classroom intervention) and included the following components: (a) establishing classroom rules, (b) assigning students to teams, (c) recording the frequency with which teams exhibited inappropriate behavior (i.e., broke the rules), and (d) rewarding the team who the broke the rules the least number of times, or rewarding both teams if both exhibited inappropriate behavior less than a pre-set criteria. Barrish et al. (1969) reported the successful reduction of target behaviors "talking-out" and out-of-seat.

Litow and Pumroy (1975) described three categories of group contingencies: independent, dependent, and interdependent group contingencies. Independent group contingencies (e.g., Brantley & Webster, 1993; Lum et al., 2019) establish consequences (i.e., rewards) that are available to all members of a group who meet criterion. However, only the individuals who meet the criteria gain access to that reward. For example, Brantely and Webster (1993) created classroom rules related to appropriate school behaviors such as remaining in one's seat and seeking teacher permission before talking. Students who exhibited these skills earned checks on a poster in the front of the room. Students who earned enough check marks each day were able to access a reward at the end of the week. Students who did not earn enough

checks did not have access to the reward. Thus, individual behavior during independent group contingencies impacts the individual only and does not impact other members of the group. Independent group contingencies have been effective in increasing academic engagement (Lum et al., 2019), decreasing disruptive behaviors (Herman & Tramontana, 1971; Brantley & Webster, 1993; Groves & Austin, 2017), increasing social interactions (Pokorski et al., 2019), and increasing task completion (Deshais, Fisher, & Kahng, 2019).

In a dependent group contingency, the performance of a selected individual or small group determines the entire group's reward. By incorporating students' peers in the intervention, socialization and cooperation may be enhanced when target goals are met (Hansen & Lignugaris/Kraft, 2005). However, this arrangement can also result in negative peer interactions, such as retaliation, threats, and social isolation when goals are not met (Romeo, 1998). To counter negative peer interactions, researchers have randomized the dependent student, as well as kept the identity of the randomly selected student unknown to the group (Hansen & Lignugaris/Kraft, 2005; Heering & Wilder, 2006; Jones et al., 2008; Williamson et al., 2009; Deshais et al., 2018). Cariveau and Kodak (2017) increased the academic engagement of first grade students attending a summer reading program using a dependent group contingency with a randomly selected target individual. Prior to beginning the reading group, a criterion level of engagement was stated. For example, the mystery person needed to get eight points to access reinforcement for the group. Researchers randomized the selection of the student whose behavior determined reward outcome. Once criterion was met, the instructor stopped the lesson and informed the group of the mystery person, while also thanking that person for being attentive. The group then accessed a reward, previously identified by a preference assessment. If the mystery person did meet criterion, that person was not identified, and the students were

informed they would try again the next day. Thus, individual behavior during dependent group contingencies impacts the individual if and only if they are the selected target or a member of the selected target group and impacts the group if and only if they are the selected target or a member of the selected target group. Dependent group contingencies have been used to increase on-task behavior (Heering & Wilder, 2006), decrease problem behavior (Reitman et al., 2004), improve social interactions (Hansen & Lignugaris/Kraft, 2005; Shapiro et al., 1986), as well as increase accurate completion of arithmetic worksheets (Speltz et al., 1982).

Interdependent group contingencies are the most often applied form of class-wide interventions (Pokorski et al., 2017; Little et al., 2015; Maggin et al., 2012). This iteration of group contingencies specifies access to preferred items or activities contingent upon the performance of all members in the group (Litow & Pumroy, 1975). Thus, individual behavior during interdependent group contingencies always impacts both the individual and the group. Interdependent group contingencies have been used to improve academic engagement (Cihak et al., 2009) and assignment completion (Schakel & Darveaux, 1984) as well as to decrease verbal and physical aggression (Saigh & Umar, 1983), noncompliance (Swiezy et al., 1993) out-of-seat behaviors (Medland & Stachnik, 1972), and transition durations (Campbell & Skinner, 2004). As well, the aforementioned GBG (Barrish et al., 1969) relies on interdependent group contingencies.

To determine the most effective group contingency type, researchers have evaluated their differential effects. Gresham and Gresham (1982) were the first to conduct a study including all three types of group contingencies. The evaluation of the relative effectiveness of interdependent, independent, and dependent group contingencies on the disruptive behavior of children with intellectual disabilities resulted in two conditions with decreased disruptive

behavior. Specially, interdependent and dependent contingencies were associated with decreases in problem behavior. Levels of disruptive behavior observed during the independent condition was more variable and approximated those of baseline. Researchers noted the successful conditions were likely more effective because of the element of group cooperation. This outcome was evidenced by children cueing and praising team members for emitting low rates of problem behavior. When the independent group contingency was in place, this behavior was not observed. The design of the study (ABCDABCD reversal) did not allow for direct comparison between the two successful conditions to establish which was more effective.

To counter the design limitation of Gresham and Gresham (1982), numerous studies have since utilized an alternating treatment design (ATD) to compare the effects of group contingencies. Wolery et al. (2014) posit the rapid alternation of conditions controls for carry-over effects, making it useful in selecting the most effective intervention. For example, Theodore et al. (2004) used an ATD to compare the effects of all three contingencies on reducing the disruptive behavior of three high school boys with serious emotional disturbance. All three conditions were effective in reducing problem behavior.

Other studies have evaluated the differential effects of group contingencies on appropriate, or desirable, academic behavior. Alrice et al. (2007) sought to determine the relative effects of each type of group contingency on reading fluency. Eight fourth grade students in a remedial reading class participated in the study. Words read correctly per minute on curriculum-based measurement probes functioned as the dependent variable. In the independent condition students accessed a reward if they met their individualized goals. In the interdependent condition, students accessed a reward if the class average performance met the averaged classroom goal. In the dependent condition a random student was selected. If that random student

met their individualized goal, the class accessed a reward. Results indicated all three group contingency types were similarly effective in increasing fluency rates.

Lynch et al. (2009) assessed the effects of all three group contingency types on homework completion and accuracy for 6 fifth-grade students with a learning disability or speech impairment. Results indicated that all three contingencies increased both homework completion and accuracy rates. Similar to Gresham and Gresham (1982), the research team noted slightly more effective results in the interdependent and dependent conditions, with regards to homework accuracy. Researchers discovered after the completion of the study the classroom teacher was still utilizing the interdependent contingency.

Given mechanistic contingency differences (i.e., whether individual behavior impacts the individual, the group, or both), the similar efficacy among group contingency types reported in these studies are noteworthy. Independent group contingencies, in which each group member's performance and subsequent potential access to a reward is disconnected from the remainder of the group, results in this contingency type as the least likely to promote cooperation and collaboration (Little et al., 2015). Dependent and interdependent group contingencies, conversely, utilize influence to promote connections among group members. Dependent contingencies require that only one member of the group meets criterion for the entire group to access a reward, allowing for encouragement from group members to reach a common goal (i.e., the reward). Considering the behavior of all other group members are not required to meet criterion and the often-unknown nature of the target individual(s), the opportunity for accidental reinforcement exists. In other words, a member or members of the group could engage in the behavior targeted for reduction and still "earn" the reward, incidentally leading to reinforcement of the targeted problem behavior. Interdependent group contingencies require that the behavior

of all group members contribute to meeting criterion. Thus, accidental reinforcement of problem behavior is less likely.

Despite these differences in how reinforcement contingencies are constructed and possibly experienced across group contingency types, studies to date support the efficacy of all three group contingency types. These similar outcomes may be the due to the relatively low number of participants included in previous group contingency research across types, particularly when dependent group contingencies are considered. Specifically, it may be possible that any group contingency type will work when the participant number is low. However, as the group size increases, the potential for experiencing the consequence regardless of behavior for any individual also increases under a dependent group contingency arrangement. The previously discussed studies each included groups of eight students or fewer. This group size means the likelihood that any given individual was the target individual was relatively high and impacts the likelihood of accidental reinforcement when compared with larger groups. In fact, a 2021 review of dependent group contingencies studies (Page et al., 2021) noted only seven studies had been published in which the unit of analysis was the entire group, rather than an individual member of the group. Of those seven, numerous suffer from design flaws such as lack of rigor or weak experimental control. The three studies demonstrating robust design and demonstrated effects were each conducted in special education settings and among groups of twelve or less. Future research should determine if dependent group contingencies are effective in altering the behavior of groups larger than twelve and outside of self-contained settings, such as a general education or collaborative setting.

Research related to the utility of group contingencies, particularly with respect to interventions to reduce problem behavior, continues to be an important research focus. Recent

research has evaluated student behavior in previously unexplored settings such as hallways (e.g., Deshais et al., 2018) and lunchrooms (McCurdy et al., 2009). Additionally, recent research has been conducted with under-researched populations such as high school students (e.g., Joslyn et al., 2019; Mitchell et al., 2015) and detained adolescents (McDougale et al., 2019).

Applications of group contingency reinforcement in transitions are particularly useful for researchers and practitioners working in educational settings. Research suggests there is a strong relationship between increased academic instructional time and student achievement (Dotterer & Lowe, 2011; Gettinger, 1995; Jez & Wassmer, 2015). In school, children frequently end one task and begin another (Schmit et al., 2000). These shifts in activity are commonly referred to as transitions (Arlin, 1979). Frequency of transitions is dependent on grade level and setting. They can include in class transitions such as physically moving between activities or centers, changing academic subjects, or beginning a new task. Transitions also include relocating to and from areas outside of the classroom learning environment (e.g., recess, lunch, specials, etc.). While estimates vary, some findings suggest that as much as 39% of a typical school day is spent transitioning (Codding & Smyth, 2008). Increases in problem behavior have been observed during transitions, relative to classroom instruction (Campbell & Skinner, 2004; Colvin et al., 1997). Despite recommendations, researchers have noted appropriate transition behavior is rarely explicitly taught and reinforced (McIntosh et al., 2004). Consequently, students may not be aware of the expectations. Further, inappropriate behaviors during hallway transitions (e.g., running, talking, pushing, hitting) may occur frequently because students are near each other, teachers have difficulty monitoring student behavior, and reinforcement for appropriate behavior is not readily available (Campbell & Skinner, 2004). Additional time spent in transitions responding to inappropriate behavior reduces time that would be spent instructing students.

To maximize instructional time, researchers have utilized group contingency protocols to increase appropriate behavior and suppress problem behavior during transitions. Early applications involved school-wide interventions with little control for potential threats to internal validity. For example, Kartub et al. (2000) implemented an intervention package to decrease the noise of middle school students transitioning to lunch. The intervention included: (a) modeling of appropriate hallway behavior, (b) practice sessions, (c) a salient blinking light to indicate when quiet is expected, and (d) additional lunch time contingent upon noise reductions in the hallway. Decreased noise was observed across all grade levels. However, because the intervention was implemented simultaneously across sixth, seventh, and eighth grades and the intervention was never removed, conclusions regarding the functional relation between hallway noise and the intervention are limited (Gast & Baekley, 2014).

Subsequent studies provided more convincing demonstrations of control. Yarbrough et al. (2004) used a withdrawal design to evaluate the effect of the timely transition game on the room-to-room transition of a sixth-grade classroom. The game included explicit timing, publicly posted feedback, and an interdependent group contingency. Researchers noted a decrease in transition times from an average of 178 s during baseline, to an average of 59 s during intervention. When the package intervention was withdrawn, researchers did not observe an immediate effect on transition time for the first session. However, on subsequent days transitions approximated baseline. This outcome may have been due to carry-over effects. Upon reimplementation of the intervention, the average transition time stabilized to a range of 33-55 s. Social validity surveys indicated students and the teacher viewed the intervention as helpful. Variations of the timely transition game have been used to increase the percentage of high school (Hawkins et al., 2015)

and middle school (Hawkins et al., 2017) students ready to begin class on time, as well as to reduce the hallway disruptions of elementary school students (VanMaaren et al., 2020).

Hine et al. (2015) evaluated the effect of computer-assisted instruction to decrease the in-class transition times of elementary school students. The package intervention utilized automated explicit instruction, randomized criterion, and an interdependent group contingency. Mean latency between the end of a transition cue and participants initiation of a new activity was decreased and the percentage of intervals on-task was increased for eight students across two classrooms, respectively. The decrease in time spent transitioning resulted in an average of 39 extra minutes of instruction per week.

In their 2018 study, Deshais et al. utilized a randomized dependent group contingency to decrease disruptive behavior of two first grade students during hallway transitions. Prior to each transition, the teacher notified students that the mystery walker game was beginning and randomly selected two students. When the mystery walker met the criteria to earn the reward for the class the teacher revealed the student's name. When the mystery walker failed to meet the criteria, the teacher informed the students that the mystery walker did not follow the rules. The identity of the student was not revealed, and no reward was delivered.

Students engage in more problem behavior in non-instructional settings such as the playground, cafeteria, or in hallways (Colvin, et al., 1997). This increased level of maladaptive behavior has three likely explanations: (a) students are in closer proximity to each other, (b) teacher monitoring of students is more difficult, and/or (c) there are fewer competing behavior options that have been reinforced (Myerson & Hale, 1984). Group contingency interventions have the potential to alter the behavior of many individuals in an efficient manner. However, the application of group contingency interventions in such settings remains limited. The purpose of

the proposed study is to expand upon transition intervention research by evaluating the comparative effects of a small-group dependent group contingency and a large-group dependent group contingency on disruptive hallway transition behavior. Chapter 2 provides a review of the literature pertaining to group contingency interventions on transition problem behavior of students.

CHAPTER 2

LITERATURE REVIEW

Classrooms provide a context for application of behavior analytic principles to impact at least two different types of behavior: academic behavior (e.g., timely and fluent task completion) and classroom citizenship behavior (e.g., following classroom rules). Addressing this second area of behavior can be achieved through several different strategies, focusing on a number of different responses that are perhaps unique to the classroom. For example, hand raising is a skill that is likely not practiced in a home environment, so students must learn the skill when they first attend an educational setting. In the early stages of acquisition, the learner must contact dense schedules of reinforcement (Hanley & Tiger, 2011). The child raising his hand to get the teacher's attention should be acknowledged on each occurrence to (a) increase the future likelihood of hand raising and (b) shift response allocation to the appropriate response (hand raising) and away from less appropriate responses (e.g., call outs). Over time the skill should be maintained. The student should continue to be called on most times he raises his hand. Differential reinforcement (Cooper et al., 2019), in which reinforcement is withheld for behaviors that are contextually inappropriate (e.g., calling out) and delivered for appropriate behaviors (e.g. hand raising), is helpful in establishing and maintaining a repertoire of desired behaviors. Devoid of differential reinforcement, calling out responses may supplant hand-raising behavior, necessitating intervention.

Whereas some classroom citizenship behaviors, like hand raising, are relatively simple to address on an individual basis, other citizenship behaviors may be more complicated to impact in this manner. For example, when a teacher wants to impact how the entire class approaches asking questions, or when a teacher wants to increase the amount of time the entire class engages

in on-task behavior, individual specific interventions may be impractical. In such situations, group-contingency based interventions may be the best choice.

Since the 1997 reauthorization of the Individuals with Disabilities Education Act (IDEA, 20 U.S.C. § 1414(d)(3)(B)(i)), there has been a nationwide push to incorporate the school-wide frameworks of Positive Behaviors and Interventions and Supports (PBIS) to teach and encourage pro-social behaviors through evidence-based practices (Feinberg & Vanlone, 2019). One tactic for teaching and reinforcing appropriate behavior is through the use of group contingencies. Cooper et al. (2019) define group contingencies as a common consequence (typically a reward intended to function as reinforcement) that is accessed contingent upon the behavior exhibited by one member, some members, or all members of a group.

Group contingencies are typically characterized as comprising three types: interdependent, dependent, and independent (Litow and Pumroy, 1975). Interdependent contingencies utilize consequences for an entire group being contingent upon the behavior of all group members (Collins et al., 2019). For example, when all students complete their homework, they may be rewarded with no homework the following evening. With dependent group contingencies, the consequences for a group are contingent upon the behavior of one member of the group or a subset of the group. For example, a teacher may offer extra recess to the entire class if one student completes class without exhibiting any disruptive behavior, sometimes referred to as the "hero game." Independent group contingencies arrange consequences for each group member contingent upon their individual performance (Cooper et al., 2019). For example, a teacher may inform students that anyone who brings in their homework completed the next day gets a piece of candy.

In their landmark 1969 study, Barrish et al. created the GBG to reduce disruptive behaviors among elementary school students. As described, the GBG is an example of an interdependent group contingency. Typical implementation of the GBG includes dividing a class into teams, establishing classroom rules, delivering feedback on rule-following behavior via marks for rule-infractions and specific verbal praise for appropriate behavior, as well as delivering contingent rewards to teams who meet criteria for rule-following (Joslyn et al., 2020). Criteria is typically a pre-set frequency of rule violations that cannot be exceeded. For example, teams receiving less than five infractions earn access to the reward. The GBG has been demonstrated to be successful in decreasing problem behavior exhibited by diverse student populations including preschool children (Donaldson et al., 2021), undergraduate students (Cheatham et al., 2017), general education students (Kleinman & Saigh, 2011), students with emotional and behavioral disabilities (Salend et al., 1989), as well as those from foreign countries such as Belize (Nolan et al., 2013) and Sudan (Saigh & Umar, 1983). The GBG has also been correlated with positive long-term outcomes such as decreased substance use/abuse (Kellam et al., 2014).

While the GBG has a long history of implementation and demonstration as effective, studies specific to the GBG, or studies that evaluate similar types of group contingencies are typically restricted to behavior exhibited by students while in the classroom. In fact, existing literature reviews have detailed the immediate and long-term impact of group contingencies on problem behavior in the classroom (Josylyn, et al., 2019; Smith, et al., 2021). However, there remains scant reviews of the literature detailing applications of group contingencies in educational contexts other than the physical classroom (e.g., hallways, cafeteria, gym, playground) and less is known about their utility in such contexts. Given the relationship

between increased academic instructional time and student achievement (Dotterer & Lowe, 2011; Gettinger, 1995; Jez & Wassmer, 2015), there is a need for efficient and effective transitions to prevent instructional time being lost responding to inappropriate behavior. The purpose of this literature review is to synthesize and analyze studies incorporating group-contingency based interventions for problem behavior during transitions.

Method

Search Procedures

The author used a multi-data base search engine (Galileo) that included PsychINFO, Social Sciences Citation Index, ERIC, Professional Development Collection, ScienceDirect, and PsycARTICLES to search for peer-reviewed articles including combinations of the following: *group contingency, group contingencies, hallway, transition, problem behavior,* and *intervention*. This process identified 32 articles which were then analyzed by title and abstract to determine if the study utilized a group contingency to intervene upon problem behavior during transitions, yielding 13 articles for qualitative analysis. Articles included for qualitative analysis met the following criteria: (a) inclusion of problem behavior during transitions, (b) targeted intervention upon problem behavior during transitions, and (c) an operant learning arrangement. Of these 13 articles, five articles were excluded from quantitative analysis because they utilized an AB approach which does not allow for the systematic replication needed to demonstrate a functional relation between the dependent and independent variables (Gast & Baekey, 2014).

The process for locating articles is included in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (Liberati et al., 2009). Figure 4 provides a flow chart illustrating this process.

Qualitative Analysis Coding

After identifying articles meeting criteria, authors examined and coded variables including: (a) participants, (b) settings, (c) research design, (d) dependent variables, (e) data collection methods, (f) independent variables, as well as (g) inclusion of reinforcement or punishment protocol.

Participants. A total of 1,626 participants were included for analysis. Participants were coded by grade level spans (elementary, middle, high, other). Elementary school included students in kindergarten through fifth grade. Middle school included students in sixth through eighth grade. High school included students in ninth through twelfth grade. Variations from these grade level spans were noted.

Settings. Settings were coded by location (urban, suburban, or rurual) and by type (public school, alternative school, or residential treatment facility).

Research Design. All studies utilized a single-case research design. Studies were coded by the type of single case research design utilized, including withdrawal, modified reversal, and multiple baseline designs. Limitations for quasi-experimental AB designs were noted.

Dependent variables. Studies were coded for the type of dependent variable identified. Categories for dependent variables included one or a combination of the following categories: (a) rate of problem behavior, (b) duration of transition, and (c) latency to "readiness."

Data collection. Studies were coded for data collectors (researchers, teachers/administrators, combination, or not listed) as well as by the unit for data collection (group behavior, individual classes, grade levels, or entire schools). All data was collected in-vivo.

Independent variable. Coding for the type of independent variable included: (a) use of a treatment package, (b) type of group contingency (interdependent or dependent), (c) the use of mystery or randomized components as well as (d) intervention implementer.

Reinforcement or punishment protocols. Contingency coding was delineated by the use of reinforcement or punishment protocols. Studies were coded for reinforcement contingencies by access to activities or tangible items. They were also coded for use of randomized or progressive performance criteria.

Quantitative Analysis Coding

Articles meeting criteria utilizing single case research designs were analyzed via the single-case analysis and review framework (SCARF; Ledford et al., 2016). Within the framework selected manuscripts consist of one or more implementations of single case designs. For example, an article utilizing a single application of a withdrawal design (ABAB) would constitute one study. An article utilizing a withdrawal (e.g., ABAB) design for three students would constitute three separate single-case design studies. Similarly, an article utilizing a multiple baseline across three participants would constitute one study. Each study is reviewed for 13 characteristics across 3 domains: rigor, quality and breadth of measurement, and outcomes (Zimmerman & Ledford, 2017). Rigor includes an assessment of reliability, fidelity, and data collection. It consists of yes/no questions regarding information such the reporting of fidelity data, interobserver agreement for at least 20% of sessions, and if at least three data points existed in each phase. Quality and breadth of measurement involves evaluations of participant and procedure descriptions as well as social validity, generalization, and maintenance. Outcomes quantifies results for primary, generalized, and maintained outcomes.

Results

Qualitative Analysis

Participants and Settings

Most studies included elementary (*n* = 6) or middle school (*n* = 4) students. Other studies included high school students (*n = 1*), combined middle and high school students (*n = 1*), or detained adolescents between the ages of 13 and 16 years old (no grade equivalent provided). Settings of studies included urban (*n* = 3), rural (*n* = 3), and suburban (*n = 1)* schools. Four articles did not include a description of the surrounding population density. Most studies occurred in public schools (*n* = 10). Five studies were set in public education settings. Two were set in alternative educational settings. One study uniquely occurred in a residential center for detained adolescents. Two studies did not specifically state the type of educational setting.

Designs and Procedures

All experiments utilized a single case design research approach. Four studies (Kartub et al., 2000; Campbell & Skinner, 2004; Leedy et al., 2004; Tyre, et al., 2011) utilized an AB approach, negating any ability to demonstrate a functional relation between the independent and dependent variables. For example, Kartub et al. (2000) assessed a package intervention including explicit instructions, salient stimuli (blinking light), and contingent rewards (extended lunch time) on the noise level of a hallway transition. Although decibel levels decreased across all three grade levels, the results could also be an effect of being observed, or of maturation. Gast and Baekey (2014) note that AB approaches fail to control for many threats to internal and external validity, providing weak conclusions.

Four studies (Yarborough et al. 2004; Hawkins et al., 2015; Hine, 2015; Hawkins, 2017) utilized a withdrawal design. Yarborough et al. (2004) incorporated an ABABAB design to

assess the impact of explicit timing, publicly posted feedback, and an interdependent group contingency on the transition times of students in a sixth-grade classroom. Hawkins et al. (2015) and Hawkins et al. (2017) utilized an ABAB design to evaluate the effect of an interdependent group contingency on the transition behavior of students in an alternative high school and middle school, respectively. Hine and colleagues (2015) utilized an ABAB design to assess the effect of automated explicit timing and transition warnings as well as a group contingency on the transition time of four elementary students.

Two studies incorporated a modified reversal design. Staub (1990), for example, used an ABACBC design to evaluate the effects of publicly posted feedback on middle school students' transition behavior. In baseline (A), students' disruptive behavior and hallway noise were measured with no intervention. In the first intervention phase (B), posters displaying graphic feedback on the previous transition were placed on both ends of the hallway. In the second intervention phase (C) Staub added verbal feedback and praise. After each transition the dean informed students via the intercom about their performance. For example, "You all were 10% quieter today. Great job." McArdle et al. (2020) also utilized a modified reversal design which included up to 4 phases. Phase A consisted of baseline; phase B consisted of intervention, which included a beat your best transition time group contingency; phase C added a teacher coaching component to the group contingency; and phase D consisted of social validity probes in which the teachers were able to lead transitions with or without components of the intervention.

Two studies utilized a multiple baseline design. Van Maaren and colleagues (2020) incorporated a multiple baseline across classrooms design to assess the effect of a group contingency package on the inappropriate hallway transition behavior of three classrooms in a summer school program. Deshais and colleagues (2018) employed a concurrent multiple

baseline design across transitions to evaluate the effect of a randomized dependent group contingency on two first-grade students.

The type of dependent variables varied across studies. Five studies focused on problem behavior variables, including unprompted verbalizations (Deshais et al., 2018; McDougale et al., 2019; Staub, 1990), running (Staub, 1990; VanMaaren et al., 2020; Leedy et al., 2004), and physical contact (DeShais et al., 2018; VanMaaren et al., 2020). McDougale et al., 2019 also measured the percent of 10-s intervals with appropriate line-walking behavior, which they defined as walking approximately an arm's length from others, not touching others, with hands behind one's back or in pockets, and speaking only when spoken to by staff. Two studies measured the decibels of noise during transitions (Kartub et al., 2000; Staub, 1990). Three studies incorporated evaluated the duration of transitions (Campbell & Skinner, 2004; McArdle, et al., 2020; Yarborough et al., 2004). Two experiments focused on readiness, which was operationally defined as the number or percentage of students with bottoms in chairs, eyes directed toward the teacher or front of the classroom, and not being physically or verbally disruptive at the beginning of class (Hawkins et al., 2015; Hawkins et al., 2017). Hine and colleagues measured the latent time between a cue to transition and the beginning of that activity with three seconds of consecutive sitting, quiet or task-related talking, and academic engagement. Tyre et al. (2011) measured the frequency of students not in their assigned seat immediately following a tardy bell.

Data were most often collected by researchers (Hawkins et al., 2015; Hine et al., 2015; McArdle et al., 2020; VanMaaren et al., 2020; Yarborough et al., 2004). Three studies utilized school staff such as teachers or administration to collect data (Kartub et al., 2000; Leedy et al., 2004; Tyre et al., 2011). Two studies did not include a clear explanation of who served as data

collectors (Staub, 1990; Deshais, 2018). The Hawkins et al. (2017) study involved a combination of school staff and researchers, in which the teacher served as the primary data collector and graduate students collected secondary data used to calculate interobserver agreement.

The most common unit for data collection was group behavior (n = 12). Within the behavior of a group data was specifically collected on individual classes (n = 6), grade levels (n = 3), and entire schools (n = 1). The McDougale et al. (2019) study used a group of detained adolescents as the unit. Two studies focused on the behavior of individual students (Hine et al., 2015; Deshais et al., 2018).

Studies also differed by the treatment package and type of group contingency utilized. Eight studies incorporated packaged interventions containing randomized criteria and interdependent group rewards. Five studies utilized variations of the timely transition game. Campbell and Skinner (2004) implemented the original iteration of the intervention, which combines explicit timing with an interdependent group contingency to decrease the latent periods between students being instructed to line up and their departure from the classroom. The research team encountered an unexpected problem when the teacher refused to withdraw the intervention, failing to control for instrumentation and history threats to internal validity. Yarbrough et al., (2004) expanded upon this line of research, exhibiting experimental control in ABABAB withdrawal design. Hawkins et al. (2015) and Hawkins et al. (2017) utilized an interdependent group contingency package to increase the percent of students ready to begin class at the start time. VanMaaren and colleagues (2020) added a response component to the timely transition game, in which appropriate transition infractions resulted in added time to the transition, making it less likely the class would meet their goal. Deshais et al. (2018) was the only study to utilize a dependent group contingency. In their study, a randomized unknown “hero student” was selected

for both the boy and girl lines. If the mystery student transitioned quietly with his/her hands to himself/herself, that person would earn a piece of candy for each member of their group. Despite the intervention being implemented in a classroom of 19 first-grade students, the unit of analysis was two individual students. Therefore, data were only collected on the behavior of those two students.

Implementation of the independent variable varied across studies. Five studies utilized the teacher as the implementer. For example, in Hawkins et al., 2015 study, students were given five minutes from the beginning of the transition to be ready to begin the next activity. The teacher served as implementer by announcing the time to begin, scanning the room to determine the number of students meeting "ready" criteria, announcing the number of students meeting criteria, selecting a randomized number for the reward, and announcing if enough students met or exceeded the randomized number. Two studies utilized the researcher for implementation. Two studies also utilized a combination of teacher and researchers. For example, in VanMaaren's 2020 modified timely transition study, researchers presented a reward board, announced students were working to earn a class party, and reminded them of the transition expectations. The teacher then informed students it was time to line up. Researchers began and stopped a timer once students initiated and completed the transition, respectively. The teacher provided feedback as well as a reward, if earned.

Most studies included some type of reward or reinforcement protocol for team(s) who met criteria. Eight studies included contingent access to an activity such as a movie, party, or recess. For example, participants in the VanMaaren et al. (2020), Campbell and Skinner (2004), and Yarbrough (2004) earned letters of the word "party" contingent on appropriate behavior. Once the students earned all of the letters, the teacher provided access to a movie and

popcorn. Participants in the Kartub et al. (2000) and Hine et al. (2015) studies earned additional lunch and recess time, respectively. Five studies included tangible rewards, most commonly edibles. Detained adolescents in the McDougale et al. (2019) study earned access to full-size candy bars. Other tangible rewards included school supplies (Hawkins, et al., 2015; Hawkins, et al, 2017; McArdle, et al., 2020). Two studies included contingent praise and/or acknowledgement as the sole reward. Tyre et al., (2011) was devoid of any reward or reinforcement protocol. Rather, the study incorporated progressively intensive putative punishers for tardiness. For the first to third tardies, students were required to leave the classroom and attain a postcard, which was completed indicating why they were tardy. The postcard was sent home to the parent(s)/guardian(s). Students accumulating four to six tardies were assigned lunch detention. Students accumulating seven to nine tardies were assigned after-school detention. Those individuals with greater than nine tardies were required to attend detention after school on Fridays and a conference was arranged with parent(s)/guardian(s).

Criteria to access reinforcement also differed. Six studies included randomized criteria to access reinforcement. Five of those studies included unknown randomized criteria, which were compared to the group performance during feedback. For example, in the Hawkins (2017) study, the teacher instructed students that it was time to begin class. She scanned the room and counted the number of students exhibiting ready behavior, defined as seated at the appropriate desk, eyes directed toward the teacher, quiet, and not being physically disruptive. The teacher announced the number of students exhibiting ready behavior and then picked a random number from a bag. If the number of students exhibiting ready behavior was the same or greater than the number drawn, the teacher then picked a randomized reward for students. Participants in the Hine et al. (2015) study were presented with a randomized timer on the interactive white board. Groups

transitioning to the next center before the timer ran out, were able to color in a segment on a thermometer image. Once they colored all segments, they earned extra recess time. Two studies incorporated progressive performance criteria. Participants in the McDougale et al. (2019) study were required to beat the previous score. Students in the McArdle et al. (2020) study were required to beat their previous best score.

Quantitative Analysis

Eight experiments encompassing 24 studies met the criteria for quantitative analysis via the single case analysis and review framework (SCARF). Four experiments employing A-B approaches were not included due to their inability to allow for identification of functional relations and their failure to control for potential threats to internal validity (Gast & Baekey, 2014). IOA for quantitative coding was collected by a fellow doctoral candidate for 50% of experiments and 66.7% of the studies. IOA was calculated by dividing the number of agreements by the total possible agreements and multiplying by 100%. Mean agreement was 85.3% (range 83.1-95.9%, by study).

Single Case Analysis and Review Framework

The SCARF is a tool for evaluating the design and outcomes of single case studies (Ledford, et al., 2016). It was designed to assess a group of studies for the purposes of answering "does *X intervention* improve *Y behaviors* for *Z participants"* by providing researchers with yes/no questions which yield quantifiable scores in three domains: rigor, quality of measurement, and outcomes (Zimmerman & Ledford, 2017). These scores are then plotted on three separate graphs allowing for visual inspection. Rigor, the first domain, requires that researchers assess dependent variable reliability (e.g., IOA), independent variable reliability (e.g. program fidelity), and sufficiency of data. The second domain allows researchers to evaluate

studies' Quality of Measurement (*QoM)*, which includes descriptions of participant and conditions, social and ecological validity, as well as measurement of the primary dependent variable, generalization, and maintenance. In the third and final domain reviewers gauge outcomes, including separate assessments of primary, maintained, and generalized outcomes.

Rigor

Included studies averaged a score of 2.4 (range = 1.3–3; possible range 0-4) on the indices of rigor (reliability, fidelity, and sufficient data; see Tables 1-4), indicating moderate rigor across studies. Within rigor, studies scored highest on data sufficiency (M = 3.2) and lowest on fidelity (M = 1.7) with four studies reporting no information or data regarding correct implementation of the independent variable. Reliability scores averaged 2.75 across studies.

Quality of Measurement

Quality of measurement scores were derived from ratings associated with ecological and social validity, variable descriptions, and measurement (see Tables 1-4). Across studies the average quality of measurement score was 1.5, with a range of 1.1 to 1.9 (possible range 0 – 4). In general, studies had higher scores related to methodological descriptions such as conditions and dependent variables and lower scores related to generalization, maintenance, and social/ecological validity. In particular, the McDougale et al. (2019) study included the sole measurement of stimulus and response generalization. The McArdle et al. (2020) studies included the only maintenance measurements.

Outcomes

Primary effect outcomes ranged from 1 to 4, with an average of 3.0, indicating overall positive effects (see Tables 1-4, Figure 5). Twenty-one of the 24 studies scored 3 or higher on primary effects. Eleven of those studies demonstrated consistent and replicated effects as well as

high overall quality and rigor. Ten studies demonstrated consistent and replicated effects but lower overall quality and rigor. The three studies with lower outcome scores indicated weak effects as a result of overlapping data across conditions.

Outcomes for generalization and maintenance effects were less robust. The average generalization effect was .2, with a range of 0-4 (see Tables 1-4, Figure 6). As previously noted, the McDougale et al., (2020) study presented the only generalization effect. This study received the highest possible rating (4), because generalization was shown across novel settings and implementers. Maintenance effects were slightly higher with an average of .5 and a range of 0-4 (see Tables 1-4, Figure 7). Four studies, all from the same experiment (McArdle et al., 2020) presented the only maintenance effects. In all cases, two maintenance probes were collected. Two studies indicated maintained outcomes and received a score of four. Two studies indicated depreciating outcomes and received a score of two.

Discussion

Despite research supporting transitions as times in which problem behavior increases (e.g., Campbell & Skinner, 2004), there remains minimal research on effective interventions. This literature review outlines emerging support for the use of group contingencies to decrease problem behavior during transitions for students and adolescents. With the exception of the McDougale (2019) study, all participants were in educational settings. Future research should include other settings such as group homes, day care centers, or prisons.

Interventions for problem behavior during transitions were summarized, coded, evaluated via the Single Case Analysis Review Framework (SCARF). Given that studies overall included deficient fidelity scores, functional relation concerns are warranted. For example, McDougale, et al. (2019) and Staub et al. (1990) included no information regarding procedural adherence.

Hawkins et al. (2015), Hawkins et al. (2017), and VanMaaren et al. (2020) were devoid of fidelity ratings for baseline conditions. Procedural adherence data is pertinent to ensure that the independent variable was the cause for the change in the dependent variable as well as to ensure the intervention is capable of being implemented. The most common intervention implementer was classroom teachers. If teachers are incapable of accurately implementing the intervention, the study has limited practical applications.

Given only four studies included maintenance probes, the longevity of effects is unclear. Similarly, only one study assessed generalization. Future studies should incorporate evaluations of effects and generalization of skills beyond the purview of the study's narrow conditions.

Results indicated interdependent group contingencies were the most utilized type of group contingency in the studies reviewed. Further, they yielded favorable results. Three studies (Theodore et al., 2004; Kraemer et al., 2012; Ennis et al., 2016) have suggested that all three types of group contingencies are effective in reducing problem behavior for groups. Only one published study (Deshais et al., 2018) evaluated the impact of dependent group contingencies on student transition behavior. That study assessed the effect at the individual level of two students, providing no information about the impact of the contingency on the group as a whole. This finding is not surprising, given there is a dearth of research of evidencing dependent group contingencies altering the behavior of large groups. A 2021 review of dependent group contingencies (Page et al., 2021) noted that only seven studies have been published in which the unit of analysis was the entire group, rather than an individual member of the group. Of those seven studies, two suffered from a lack of rigor, yielding questionable results. Briesh et al. (2013), as well as Heering and Wilder (2006), utilized a multiple probe/baseline design across

two classrooms. Gast et al. (2014) note that three or more tiers (behaviors, conditions, or participants) are required in a multiple probe/baseline design to demonstrate experimental control. Other studies were conducted with enhanced rigor, but demonstrated weak experimental control. Hartman and Gresham (2016) compared the differential effectiveness of interdependent and dependent group contingencies in a multiple baseline design and found that two of three classes' disruptive behavior approximated baseline in the dependent condition. Similarly, Ralston's 2011 study found dependent group contingencies had weak effects homework completion and accuracy, as results across baseline and intervention conditions overlapped. Only three studies exhibited a rigorous design and experimental control. Each of those studies included measures of behavior for the entire class but were limited in class size. Gresham and Gresham's 1982 study included twelve students in a self-contained special education classroom at a middle school. Speltz et al. (1982) also involved 12 students with special education needs. Jones et al. (2008) involved seven students with special education needs at a middle school. Thus, there is a dearth of research evidencing the effectiveness of dependent group contingencies in changing the behavior of groups with greater than 12 members.

It is possible that in smaller groups, in which the likelihood is higher (e.g., $\geq 20\%$) of being selected as the randomized, mystery person whose behavior is being monitored, that there is greater social pressure on group members to meet criteria. As group size increases, the likelihood of being selected also decreases. Also, as group size increases so does the number of members whose behavior does not contribute towards criteria. This results in opportunities for a greater number of students to engage in problem behavior and still access a reward. It is, therefore, likely that as the number of group members increase, so does the likelihood of accidental reinforcement. To date there have been no studies that directly compare the efficacy

of small- and large-group dependent group contingencies on the behavior of the group as a whole.

The purpose of the present study was twofold: 1) to provide an evaluation of the impact of dependent group contingencies on the problem behavior of primary students during hallway transitions and 2) to directly compare the efficacy of a small-group and large-group dependent group contingency as an intervention for problem behavior exhibited by students during hallway transitions. We hypothesize that: (a) the large-group dependent group contingency will result in greater variation in student responding and (b) the small-group contingency will result in lower and more stable levels of problem behavior during transitions.

Chapter 3

Methods

Participants and Setting

Participants included elementary school students from three classes in a rural school district serving economically disadvantaged and largely minority students in the South-Eastern United States. The number of students in each classroom ranged from 14-16, for a total of 44 students across the three classes. The principal of the school, in conjunction with the author, nominated the classes based on problem behavior observed during hallway transitions. Prior to implementing the intervention evaluation, the author observed nominated classes and collected baseline data on the dependent variables listed below to confirm that problem behavior occurred during transitions. Classes moved into the intervention phase of the study if class-wide problem behavior was observed to occur consistently during more than a third of observed intervals. This level of problem behavior would provide sufficient room to determine any effect of intervention.

Dependent Variables, Data Collection, and Interobserver Agreement

Dependent variables for students included noise-production, touching, and elopement. Noise-production was defined as creation of sounds (e.g., vocalizations, stomping, clapping) without teacher permission. Noise-production excluded sounds such as coughing or sneezing. Touching was defined as making physical contact with another student or an object (e.g., walls, water fountains) in the environment without explicit permission. Elopement was defined as the student standing or walking greater than 1m outside of the line of students. Transitions were video recorded via cell phone camera.

Data were collected using a 10-s partial-interval recording system. Any instance of the dependent variable(s) exhibited by any student in the frame of the video during any given

interval was scored as an occurrence. Data were collected by the author and a behavior specialist employed by the school using the date collection sheet attached in Appendix A. At least 30% of sessions across conditions included a secondary data collector for interobserver agreement (IOA) purposes. IOA scores were calculated using the exact interval-by-interval method. An agreement was scored for an interval if both data collectors scored an occurrence or nonoccurrence of the dependent variable(s). Agreements were scored as 1 and non-agreements scored as 0. Agreements were then added and divided by the total number of intervals for that session, multiplied by 100 yielding an IOA score. Table 1 summarizes and reports IOA coefficients. With the exception of the Class 1 baseline condition (77.7%), IOA coefficients were above 80% and did not systematically vary across phases or conditions.

Design and Procedures

A multi-element design with pre-intervention baseline, followed by best treatment was utilized to evaluate the effects of a small-group and large-group dependent group contingency on problem behavior during transitions. Following initial baseline sessions, the multi-element design included three alternating conditions: baseline, small-group (3-5 students) dependent group contingency, and large-group (whole class, 15-16 students) dependent group contingency. In this comparison phase were pseudo-randomized so that no condition would repeat more than twice. Treatment sessions were weighted to occur twice as often as control conditions. Sessions across conditions consisted of hallway transitions to the cafeteria from the classroom (Transition 1) and from cafeteria to the classroom (Transition 2). Data were recorded for the entirety of both transitions and reported as both aggregate and separate.

Baseline. Prior to each baseline session, the teacher(s) informed students to line up in single file order. During baseline sessions, students were instructed to follow the hallway rules

while walking in line to and from the cafeteria. The rules were: (1) while in line there is no talking or making of sounds; (2) students must keep hands to themselves, not touching others or any objects; (3) walk on the blue line. Students were only allowed to talk or touch items if they had the teacher's permission. Within 5 min of the end of the transition students were provided performance feedback. If all students met criteria (i.e., followed the rules) they were thanked. If students did not, they were given corrective feedback but not named. For example, "students remember to keep our hands to ourselves and not touch the walls." Baseline sessions occurred prior to the comparison phase and additionally were interspersed between sessions of the comparison phase to allow for a demonstration of experimental control (Wolery et al., 2014). Criteria for ending initial baseline phase included an increasing trend or stable data above 50% of intervals with problem behavior in sessions for three or more sessions.

Comparison. Prior to implementing the comparison phase, the class was divided into teams, based on the physical arrangement of the class. For example, students sitting in a row together functioned as a team. Teams already existed and were clearly marked in Classes 1 and 3. The author and teacher for Class 2 agreed on teams for Class 2. Students from all classes were informed that they would be playing one of two games during transitions to try and earn a reward. The author explained to the students the two games by saying, "In both games, you will line up in single-file order. In both games, you must follow the rules to help your team or class earn a reward. The rules were then reviewed. During the 'team hero game,' one member of your team will be secretly picked. That person must follow the rules during the entire transition to earn the reward for your team. During the 'class hero game,' I will pick one mystery person from the whole class to watch. If the mystery person follows the rules on the way to the cafeteria

and on the way back, that person will earn the reward for our whole class." The author then answered any questions the students posed.

Prior to beginning the game each day, the students were informed of the game they were playing, the respective contingency in place, and the rules were reviewed. After identifying the game, the teacher instructed students to line up. Data collection began once the first student crossed the threshold from between the classroom and the hallway or cafeteria and the hallway. Data collection ended when the last student in the class crossed the threshold of the transition destination.

In both contingency arrangements, a randomized student(s) was/were selected. The student was not immediately identified. Prior to beginning the comparison phase every student was assigned a number. Corresponding numbers were written onto popsicle sticks and placed into both one large bag containing all students' numbers for the entire class and into a small bag containing only the numbers of members of that team (e.g., blue team member numbers). Selection for each contingency is described below. If a student was selected and was not present, that number was replaced and new number selected. The numbers/names of the selected person(s) were written down and the popsicles were then returned to the bag.

Once the game began, the teacher observed the selected student(s) in the line for rule infractions (e.g., elopement, talking) while they transitioned to their destination. The selected students were required to meet criteria (i.e., no talking or making of sounds, hands/feet/objects to self) during both Transitions 1 and 2 for their team to access the reward. When a rule infraction occurred, the teacher was not to respond, until the transition was complete. The teacher and/or researcher then provided feedback. After each class arrived back in their classroom (i.e., after Transition 2), the teacher provided performance feedback to each team or to the class regarding

whether they met criteria. This feedback occurred within 3 to 5 min after their return to the classroom. The principal of the school requested to have all three classrooms transitioned from the cafeteria to their respective classrooms prior to delivering feedback/rewards to limit schedule disruptions, which resulted in this delayed feedback. Teams/classes were informed of the mystery person only when criteria were met by that individual. For example, "Class, today our class earned our reward because Claypool followed the rules walking silently with his hands to himself. Great job Claypool." The reward was identified and delivered at this time. If the mystery student did not meet criteria the teacher said, "Class, today the mystery person did not walk silently with their hands to themselves, so our class does not get a reward. We'll try again tomorrow."

Small-Group Dependent Contingency. The small-group contingency was referred to as the "team game." During the team game students wore colored pinnies to identify their team members and the game they were playing. For each class there was a yellow, red, black, and blue team, respectively. During small-group dependent group contingency sessions one number was randomly selected from each group bag. Only groups whose selected member met criteria were able to access the reward. For example, if the selected member from yellow and blue teams met criteria, their respective teams accessed the rewards. If the selected members did not meet criteria, their team did not access the reward. Teams earning the reward were provided with praise and the randomized student was allowed to select from the possible rewards for their team. For example, "Team yellow's mystery person did a great job walking in line today. Everyone on the yellow team thank Latesha for earning your reward. Latesha, you may pick your team's reward." The reward was identified and delivered at this time. If the team did not win the game, they were provided with constructive feedback, such as "Blue team, remember to walk without

talking or making noises next time so that we can earn a reward." Each team was provided feedback at the conclusion of the transition.

Large-Group Contingency. The large-group contingency was referred to as the "class game." Students did not wear pinnies in the class game. During large-group dependent group contingency sessions one number was randomly selected from the class bag. Prior to beginning the game, a randomized student was selected to be the mystery student. If the mystery student did not engage in any rule infractions, the teacher provided praise such as, "Class, thank Stasik for following the rules. He walked quietly with his hands to himself. Stasik you may pick the reward for the class." The reward was then selected by the student and delivered to all students. If the mystery person did not meet criteria, the person's identity was not identified and the class was provided with generic feedback, such as, "Class, the mystery person did not follow the rules today. Remember, that person needs to walk quietly and keep our hands to ourselves for the class to earn a reward."

Best Treatment. In a final phase, the best treatment was implemented. The "best treatment" was determined through a visual analysis of the level, trend, within treatment conditions, comparison with baseline conditions, as well as through the calculation of percentage of non-overlapping data. Percentage of non-overlapping data (PND) calculated by dividing the total number of sessions in which the highest data point of the superior treatment overlapped (e.g., was greater than or equal to) data points from other conditions. Five best-treatment sessions were implemented observed during this final phase.

Rewards

Prior to beginning the study, the researcher met with each teacher to determine appropriate rewards. They included tangible items such as stickers and small edibles (e.g.,

gummy bears, Skittles and Starburst). Rewards were delivered within three to five minutes of the conclusion of Transition two.

Procedural Fidelity

Procedural fidelity data were collected during comparison phase using a checklist to assess the following: (a) identification of the game; (b) review of rules and pre-corrects; (c) randomized selection of mystery persons for each group in the small-group dependent contingency or person for large-group dependent contingency; (d) nonresponse to rule infraction during sessions; (e) performance feedback was provided to the class at the end of the game; (f) reward was selected by student within 5 min of transition completion, if earned; and (g) reward was delivered immediately after being selected, if earned. Procedural fidelity was calculated by dividing the number of correct steps by the number of total steps multiplied by 100 yielding a procedural fidelity score. Table 2 summarizes and reports procedural fidelity scores. In general, the procedures were implemented with greater than 95% fidelity across phases and conditions.

Social Validity

Social validity probes were administered (i.e. given) to teachers (Appendix B) and read-aloud to students (Appendix C) at the conclusion of the study. Each question prompted answers using a Likert-type scale. Student questions included ratings of likability, perception of fairness, as well as perception of the respective games' impact on class-wide behavior. Questions for teachers included ratings of feasibility, utility, acceptability, implementation fidelity, as well as their likelihood to repeat implementation in the future.

CHAPTER 4

RESULTS

Figures 1-3 display the results of the intervention evaluations. The top panel of each figure displays the data aggregated across Transitions 1 and 2. Performance across both transitions was the basis for the programmed contingency. The bottom panels display the same data separated across transition components. Charts 1-2 illustrate the results from the student and teacher social validity surveys, respectively.

Class 1

Figure 1 displays transition data for Class 1. During the baseline phase, problem behavior displayed by the students in Class 1 occurred during a mean of 61.5% of intervals (range, 47.8-75% of intervals). During comparison phase, problem behavior decreased in each intervention condition, relative to baseline, but became more variable. Problem behavior during the large-group dependent group contingency condition occurred during a mean of 47.5% of intervals (range, 26.3-66.7%). Problem behavior during the small-group dependent group contingency condition occurred during a mean of 34.3% of intervals (range, 14.3-57.1%). Problem behavior during interspersed baseline sessions increased across sessions (M = 60.2% of intervals; range, 41.1-77.8% of intervals), but otherwise approximated those in the baseline phase. Problem behavior was lowest and most stable in the best intervention phase (small-group dependent group contingency; M = 15.6% of intervals; range 0-28.6%).

Percentage of non-overlapping data for the entire transition (i.e., Transitions 1 and 2, aggregated) between conditions was calculated for Class 1 by dividing the number of times the small-group dependent group contingency was superior to the large-group dependent group contingency, by the total number of comparisons, yielding a percentage of non-overlapping data,

or PND. The PND for small-group dependent group contingencies for Class 1 was 33.3% and 55.6% relative to large-group dependent group contingencies and interspersed baseline, respectively.

The bottom panel of Figure 1 displays transition data to (Transition 1) and from (Transition 2) the cafeteria, separately. Level and variability were similar in Transition 1 (M = 54.6% of intervals; range, 33-80% of intervals) and Transition 2 (M = 59.9% of intervals; range, 40-100% of intervals) during baseline. Problem behavior during comparison sessions decreased and were less variable during Transition 1 and 2 in both large- and small-group dependent group contingencies, relative to baseline conditions. During large-group dependent group contingencies problem behavior decreased slightly in Transition 1 (M = 50.1% of intervals; range, 33-60% of intervals) and more so in Transition 2 (M = 39.8% of intervals; range, 20-50% of intervals), relative to corresponding baseline sessions. Problem behavior was lowest during small-group dependent group contingency sessions in both Transition 1 (M = 35.6% of intervals; range, 0-80% of intervals) and Transition 2 (M = 28.2% of intervals; range, 0-60% of intervals), relative to corresponding baseline and large-group dependent group contingency sessions. Problem behavior during interspersed baseline sessions increased in Transition 1 (M = 65.5%; range, 44-87.5% of intervals), relative to baseline conditions. Problem behavior decreased but were more variable in Transition 2 (M = 58%; range 37.5-100%, relative to baseline conditions. Problem behavior across transitions was lowest during best intervention conditions, relative to corresponding baseline and comparison transitions. Transition 1 and Transition 2 decreased to a mean of 20.6% (range, 0-50%) and 25.6% (range, 0-42.9%) of intervals, respectively.

Class 2

Figure 2 displays transition data for Class 2. During initial baseline sessions, problem behavior in Class 2 stabilized after the first two sessions (M = 52.2%; range, 46-64.7% of intervals) with seven of the nine baseline sessions ranging between a relatively small window (46% and 54% of intervals). Relative to baseline, problem behavior during the large-group dependent group contingency condition decreased slightly to a mean of 47.8% of intervals but increased in variability (range, 25–84.6% of intervals). Problem behavior in small-group dependent group contingency condition decreased, relative to baseline (M=10.2% of intervals), with similar stability (range, 0-25% of intervals) to the baseline phase. The small-group dependent group contingency condition included three sessions with no observed problem behavior. Problem behavior during the interspersed baseline sessions approximated those of the baseline phase in mean (M = 57.4% of intervals) but increased in variable (range 46.7-69.2% of intervals), relative to baseline conditions. Problem behavior during best intervention (small-group dependent group contingency) phase occurred during an average of 21.7% of intervals (range, 0-37.5% of intervals), but was still less than problem behavior during the large-group dependent group contingency and baseline conditions and the baseline phase. PND for the small-group dependent group contingency was 100% and 83.3% relative to small-group dependent group contingency and interspersed baseline sessions, respectively.

The bottom panel displays transition data to (Transition 1) and from (Transition 2) the cafeteria separated. Problem behavior during the baseline phase was variable in both Transition 1 (M = 47.6%; range, 14-83% of intervals) and Transition 2 (M = 60.7%, range, 28.6-70% of intervals). During large-group dependent group contingency condition, problem behavior was increased in Transition 1 (M = 68.5%; range, 50-100% of intervals) and decreased in Transition 2 (M = 35.2%; range, 0-71.4% of intervals), relative to corresponding baseline conditions.

During small-group dependent group contingency problem behavior decreased in mean and variability in both Transition 1 (M = 17.7%; range, 0-37.5% of intervals) and Transition 2 (M = 5.36%; range, 0-14.3% of intervals), relative to corresponding baseline and large-group dependent group contingency sessions. Problem behavior during interspersed baseline sessions increased but became more stable in Transition 1 (M = 71.3%, range, 71.1-71.4% of sessions) and decreased in Transition 2 (M = 42.2%; range, 25-57.1% of sessions) relative to corresponding baseline conditions. Problem behavior during best intervention sessions increased and were more variable in Transition 1 (M = 28.3%; range, 0-42.3% of intervals) and Transition 2 (M = 14.8; range, 0-37.5% of sessions), relative corresponding small-group dependent group contingency sessions in the comparison phase but were still below corresponding baseline conditions.

Class 3

Figure 3 displays transition data for Class 3. Problem behavior during the baseline phase variable (M = 59.4% of intervals; range, 42.1-80% of intervals). Average level of problem behavior during the large-group dependent group contingency condition approximated those of the baseline phase (M = 57% of intervals; range, 33-84.2% of intervals). Problem behavior during the small-group dependent group contingency condition decreased and became more stable (M=28.7% of intervals; range, 15.4-42.8% of intervals). Problem behavior occurred at the lowest level and was most stable in the best intervention condition (small-group dependent group contingency) phase (M = 17.6% of intervals; range, 8.3-25% of intervals). PND for the small-group dependent group contingency was 100% and 83.3% relative to small-group dependent group contingency and interspersed baseline sessions, respectively.

The bottom panel displays transition data to (Transition 1) and from (Transition 2) the cafeteria separated. When viewed in this manner, problem behavior in baseline sessions was more variable but occurred less in Transition 1 (M = 36.3% of intervals; range, 0-75% of intervals), relative to Transition 2 (M = 79.2% of intervals; range, 60-100% of intervals). In large-group dependent group contingency sessions problem behavior increased during Transition 1 (M = 59.5% of intervals; range, 33.3-77.8% of intervals) and decreased, but became more variable in Transition 2 (M = 57% of intervals; range, 0-90% of sessions), relative to corresponding baseline conditions. In small-group dependent group contingency sessions problem behavior approximated baseline conditions (M = 38.1% of intervals) but were more stable (range, 16.7-42.8% of intervals) in Transition 1. Level and variability of problem behavior decreased in Transition 2 (M = 26.1% of intervals; range, 0-42.8% of intervals), relative to baseline conditions. Problem behavior in best intervention sessions occurred least and was most stable in Transition 1 (M = 14.5% of intervals; range, 0-25% of intervals), relative to corresponding baseline and comparison conditions. Problem behavior in Transition 2 (M = 20.2%; range, 0-42.8% of intervals) approximated those of corresponding small-group dependent group contingency sessions in the comparison phase.

Table 3 details the percent of sessions in which rewards were accessed by each class. Classes 1, 2, and 3 each class earned access to a reward in 66.7% of large-group contingency sessions. For Class 1, teams accessed rewards in 80.6% and 86.5% of small-group dependent group contingency comparison and best intervention sessions, respectively. For Class 2, teams accessed rewards in 83.3% and 80% of small-group dependent group contingency comparison and best intervention sessions, respectively. For Class 3, teams accessed rewards in 62.5% and

85% of small-group dependent group contingency comparison and best intervention sessions, respectively.

Social Validity Results

Table 4 details results from the student social validity probe. Overall, students scored both games similarly favorable in likeability, fairness, and preference. The largest discrepancy in scoring was noted in the efficacy of each game with 23.1% of students reporting that the small-group dependent group contingency did not help the class transition better. Only 3.8% of students reported that the team game did not help the class transition better. However, when the efficacy of the two contingencies were directly compared, 50% rated them as being the same with 19.2% and 11.5% rating the small-group and large-group dependent group contingencies as being more efficacious, respectively.

Table 5 details results from the teacher social validity probe. Overall, both interventions were rated similarly favorable for acceptability, appropriateness, and utility. There was discrepancy reported for potential future applications as 33.3% of teachers disagreed with potential future implementation of the small-group dependent group contingency to improve transition behavior. Teachers of Class 1 and 3 rated the large-group dependent group contingency as being the more efficacious intervention whereas the teacher of Class 2 rated the small-group dependent group contingency as being more effective.

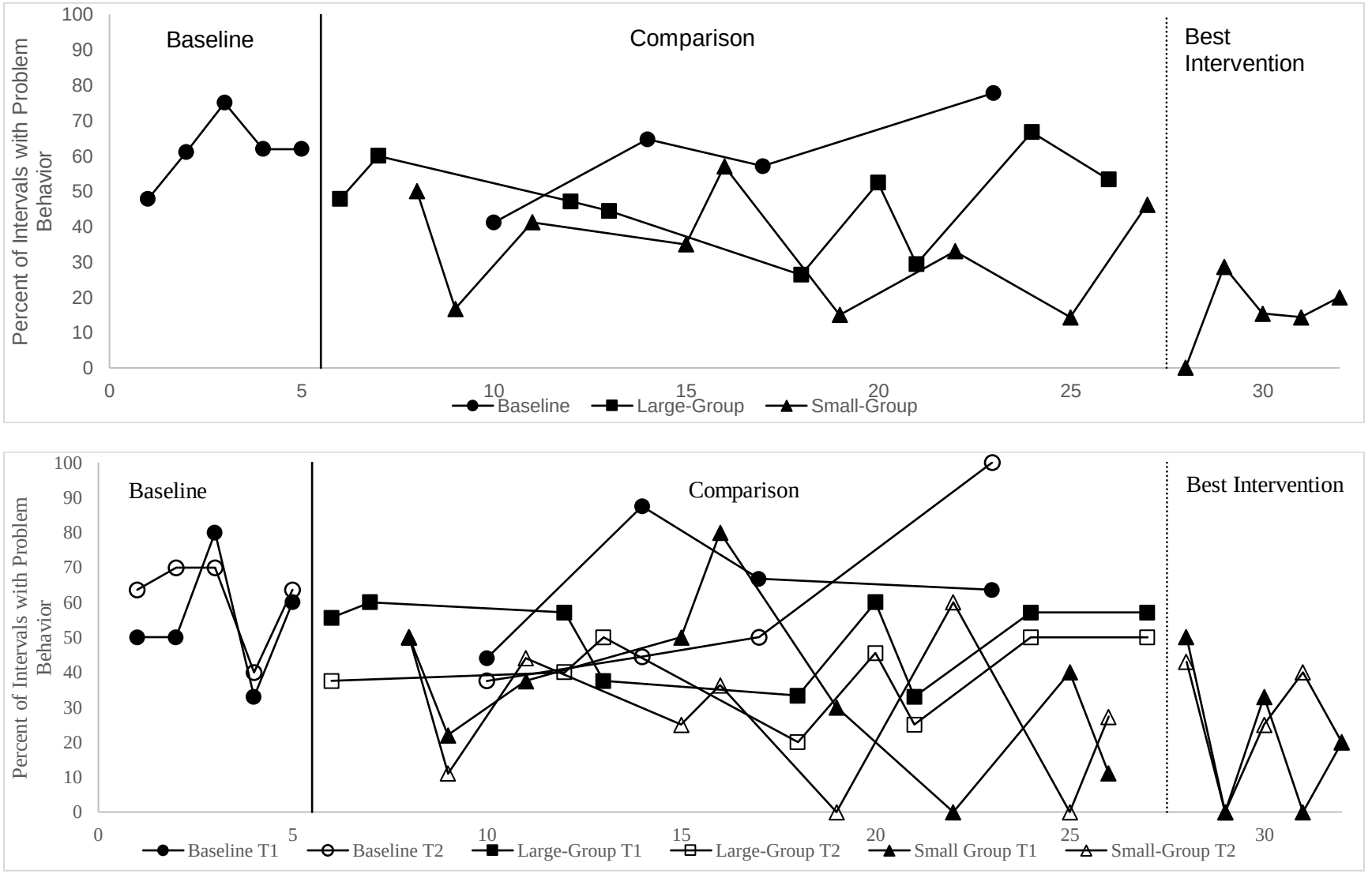

Figure 1. Total percent of intervals with problem behavior in transition for Class 1 (top panel). Percent of intervals with problem behavior in transition 1 and transition 2 (bottom panel).

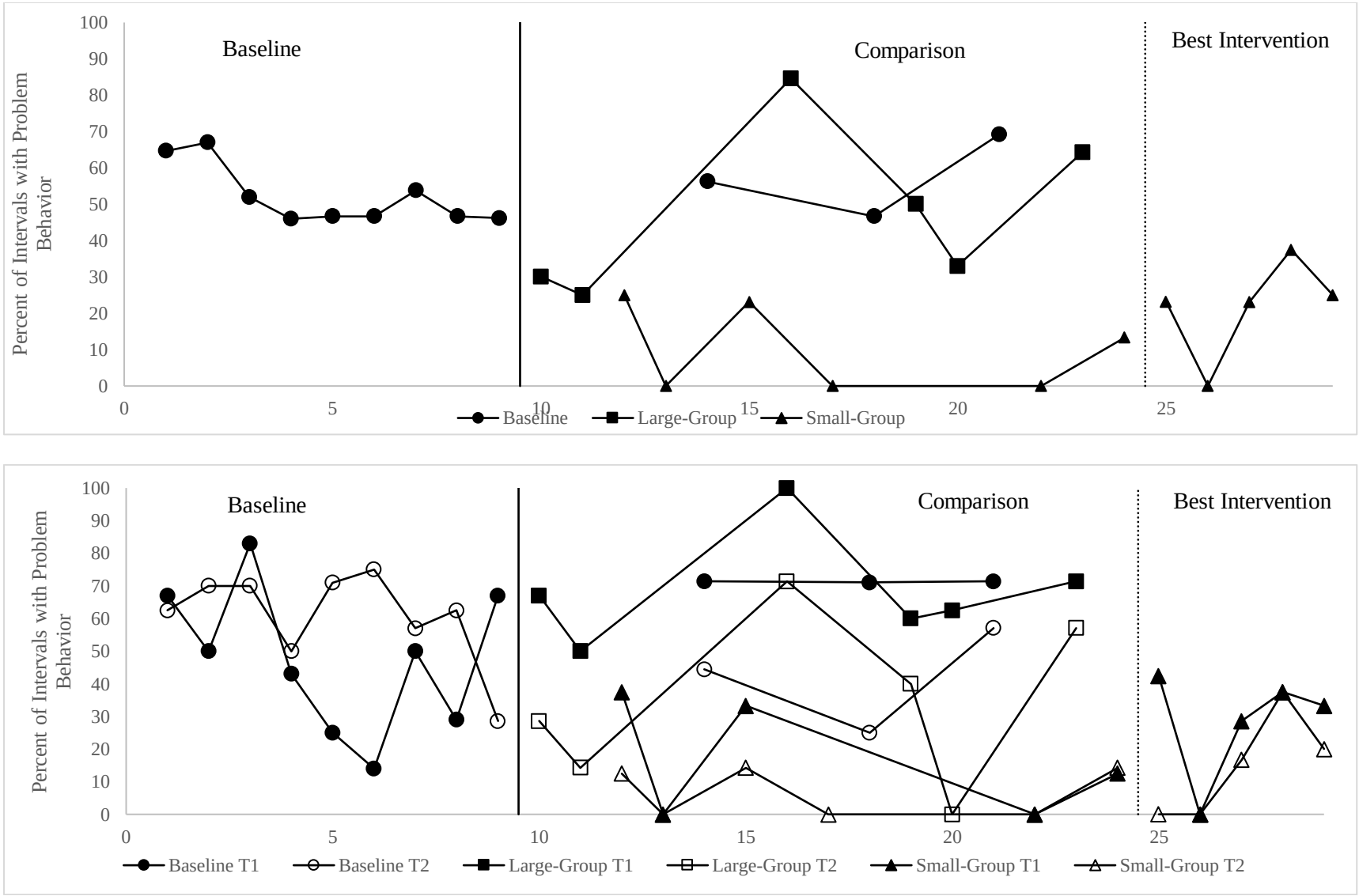

Figure 2. Total percent of intervals with problem behavior in transition for Class 2 (top panel). Percent of intervals with problem behavior in transition 1 and transition 2 for Class 2 (bottom panel).

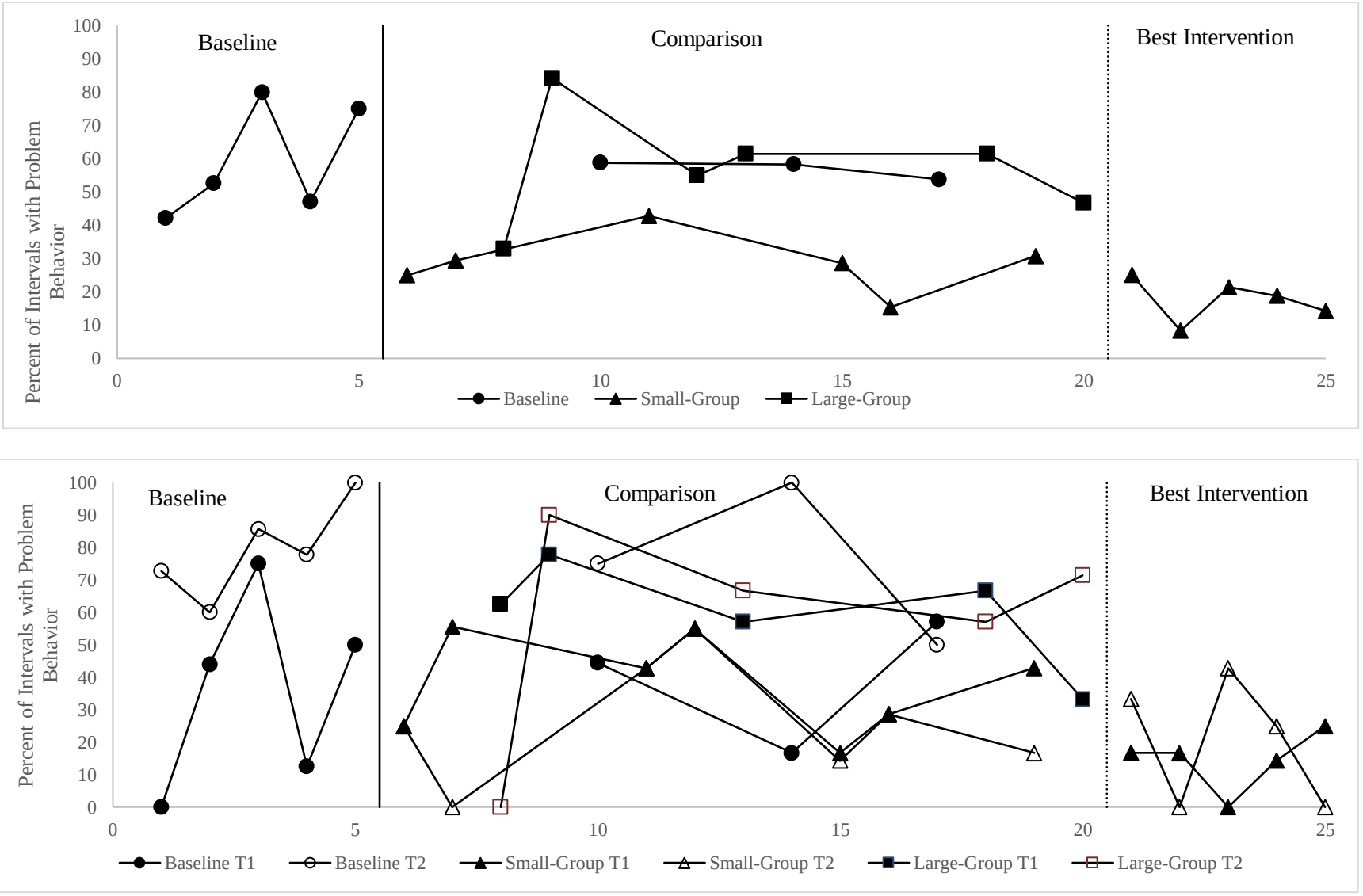

Figure 3. Total percent of intervals with problem behavior in transition for Class 3 (top panel). Percent of intervals with problem behavior in transition 1 and transition 2 for Class 2 (bottom panel).

Table 1. Percent of sessions with IOA and average IOA for Classes 1, 2, and 3.

Class	% of Sessions		Point-by-Point IOA Average (% of Intervals)	
1	*Total*	33.3	*Total*	84
	Baseline	37.5	*Baseline*	77.7
	Small-Group	33.3	*Small-Group*	87
	Large-Group	33.3	*Large-Group*	81.5
	Best Intervention	40	*Best Intervention*	88.5
2	*Total*	40	*Total*	86.5
	Baseline	33.3	*Baseline*	84.9
	Small-Group	50	*Small-Group*	85.3
	Large-Group	50	*Large-Group*	88.8
	Best Intervention	40	*Best Intervention*	88.2
3	*Total*	42.3	*Total*	87.6
	Baseline	33.3	*Baseline*	84.5
	Small-Group	50	*Small-Group*	86.8
	Large-Group	50	*Large-Group*	87.2
	Best Intervention	40	*Best Intervention*	95.9

Table 2. Percent of sessions with Procedural Fidelity and average percent steps correct for Classes 1, 2, and 3.

Class	% of Sessions		Point-by-Point IOA Average (% of Intervals)	
	Total	100	*Total*	98.5
	Baseline	100	*Baseline*	97.2
1	*Small-Group*	100	*Small-Group*	98.4
	Large-Group	100	*Large-Group*	98.4
	Best Intervention	100	*Best Intervention*	100
	Total	100	*Total*	98.4
	Baseline	100	*Baseline*	95.8
2	*Small-Group*	100	*Small-Group*	100
	Large-Group	100	*Large-Group*	97.6
	Best Intervention	100	*Best Intervention*	100
	Total	100	*Total*	98.6
	Baseline	100	*Baseline*	96.9
3	*Small-Group*	100	*Small-Group*	100
	Large-Group	100	*Large-Group*	97.6
	Best Intervention	100	*Best Intervention*	100

Table 3. Percent of sessions with rewards earned by contingency type and Team

Class	Contingency Type	% of Sessions	
	Large-Group	66.7	
	Small-Group	*Comparison*	*Best Intervention*
1	*Yellow*	100	100
	Blue	100	80
	Red	77.8	80
	Black	44.4	60
	Large-Group	66.7	
	Small-Group	*Comparison*	*Best Intervention*
2	*Yellow*	66.7	40
	Blue	83.3	80
	Red	83.3	100
	Black	100	100
	Large-Group	66.7	
	Small-Group	*Comparison*	*Best Intervention*
3	*Yellow*	83.3	80
	Blue	50	60
	Red	50	100
	Black	66.7	100

Table 4. Student social validity responses by percent.

	No	*Somewhat*	*Yes*
Was the team game fair?	11.5	0	88.5
Was the class game fair?	7.7	19.2	73.1
Did you like playing the team game?	0	15.4	84.6
Did you like playing the class game?	3.8	15.4	76.9
Did the team game help your class do better in the hallway?	23.1	23.1	42.3
Did the class game help your class do better in the hallway?	3.8	34.6	57.7
	Team Game	*Class Game*	*Same*
Which game did you like more?	11.5	3.8	69.2
Which game helped your class do better in the hallway?	11.5	19.2	50

Table 5. Teacher social validity responses by percent.

	Strongly Disagree	*Disagree*	*Slightly Disagree*	*Slightly Agree*	*Agree*	*Strongly Agree*
The team hero game is an acceptable intervention for problem behavior during transitions.	0	0	0	33.3	66.6	0
The class hero game is an acceptable intervention for problem behavior during transitions.	0	0	0	33.3	66.6	0
Most teachers would find the team hero game an appropriate intervention for problem behavior during transitions.	0	0	0	33.3	33.3	33.3
Most teachers would find the class hero game an appropriate intervention for problem behavior during transitions.	0	0	0	33.3	33.3	33.3
The team hero game was effective in improving transition behavior.	0	0	0	0	100	0
The class hero game was effective in improving transition behavior.	0	0	0	33.3	66.6	0
I would suggest the team hero game to other teachers to improve transition behavior.	0	0	0	33.3	66.6	0
I would suggest the class hero game to other teachers to improve transition behavior.	0	0	0	0	100	0
I was able to implement the team hero game correctly.	0	0	0	0	100	0
I was able to implement the class hero game correctly.	0	0	0	0	100	0

In the future, I would implement the team hero game again to improve transition behavior.	0	33.3	0	0	66.6	0
In the future, I would implement the class hero game again to improve transition behavior.	0	0	0	0	66.6	33.3

	Team Hero	*Class Hero*	*No Preference*
Which game was more effective in improving the transition behavior of your students?	33.3	66.6	0

Chapter 5: Discussion

Problem behavior during hallway transitions occurs for several possible reasons: (a) students are in closer proximity of each other, (b) teacher monitoring of students is more difficult and/or, (c) there are fewer competing behavior options that have been reinforced (Myerson & Hale, 1984). Despite the need for evidence-based interventions, research into effective intervention for this difficult portion of the school day has been limited. The current study compared the efficacy of small- and large-group dependent group contingencies on problem behavior during hallway transitions.

Two research questions were asked in the present study: (1) what is the impact of group contingencies on problem behavior during hallway transitions and (2) does a small-group dependent group contingency result in better outcomes (both with respect to reduction in problem behavior and stability) than a large-group dependent group contingency? The results of the study produced equivocal findings with respect to the impact of group contingencies. Specifically, large-group dependent group contingencies did not result in lower levels of problem behavior relative to the baseline condition of the comparison phase, whereas small-group dependent group contingencies did result in lower levels of problem behavior relative to the baseline condition of the comparison phase. In addition, the results indicated that the small-group dependent group contingency clearly resulted in reduced problem behavior relative to the large-group dependent group contingency for two classes (2 and 3), while this difference was less pronounced for one class (1). Finally, the results suggested greater variability in responding during the large-group dependent group contingency condition relative to the small-group dependent group contingency for two of the classes (2 and 3).

In the small-group arrangement, students were split into groups of three to five students. In this arrangement, any given student had a 20-33% likelihood of being the randomized, mystery person, whose behavior contributed toward the contingent delivery of a reward. In the large-group arrangement, students were in groups of 14-16 students. In this arrangement, any given student had a 6.3-7.1% likelihood of being the randomized, mystery person, whose behavior contributed toward the contingent delivery of a reward. The best intervention for all three classes was the small-group dependent group contingency. Given that the reward, reward schedule, timing of the reward delivery, and transition requirements were held constant across intervention types, the findings suggest that the higher likelihood of being selected made the small-group dependent group contingency more effective. The large-group arrangement afforded a greater number of students the opportunity to engage in problem behavior and still access the reward, which provides a potential explanation for the increased variability observed in the large-group arrangement, relative to baseline and small-group arrangement, for Classes 2 and 3.

The use of pinnies in the small-group design may offer an alternative or additional reason for differentiated outcomes. Given they were not used in the large-group dependent group contingency condition, the pinnies may have served as a more salient reminder that reinforcement was available for students who followed the rules while in line. Future replications could include pinnies across interventions to reduce the likelihood of this confounding the results. For example, during the team game all students could wear green colored pinnies.

The current study extended research regarding transition behavior in educational settings in a number of ways. First, the study demonstrated a decrease in average problem behavior for two classes of greater than 14 students through the implementation of small-group (5 students or less) dependent group contingencies and one class of 16 students through both the

implementation of a small-group and large-group dependent group contingencies. To date there has been only one published study (Deshais et al., 2018) which has evaluated the impact of a dependent group contingency on hallway transition behavior. This study evaluated the effect a dependent group contingency on the transition behavior of two students, limiting the understanding of such contingencies for larger student groups. Second, the current study extended research into group contingencies by directly comparing the effects of small- and large-group dependent group contingencies on group behavior. A 2021 review of dependent group contingencies (Page, et al., 2021) identified only seven published studies in which the unit of analysis was the entire group, rather than a(n) individual member(s). All seven of those studies included groups of 12 or less members. None of the studies reviewed by Page et al. directly compared the impact of dependent group contingences as a function of group size.

The current study afforded an opportunity to directly compare the efficacy of a large- and small-group dependent group contingency on the behavior of the group as a whole. In this study, the percentage of group members whose behavior contributed to criteria varied by arrangement. In the large-group arrangement only one person's, or 6.3-7.1% of the students, behavior determined whether a reward was accessed. Thus, it was possible that all but one student could be engaged in problem behavior and still access the reward. In the small-group arrangement, four individuals', or 25-28.6% of students, behavior contributed toward the reward criteria. This arrangement reduced the likelihood that any given student could engage in problem behavior and still access the reward. Thus, it appears that having a higher percentage of students' behavior contributing to the reward criteria was associated with greater decreases in class-wide problem behavior.

Results of this study indicate practitioners should consider selection probability to maximize the efficacy of dependent group contingencies. For example, a teacher could split their classroom into teams of five students or less. To reduce response effort, one of the potential benefits of using a dependent group contingency, a teacher could select a mystery student from each group. Students could be given an assignment to work on collaboratively with the expectation that every student complete their own assignment. Rather than grading every paper, the teacher could grade the mystery person from each group and deliver that grade to the group. Doing so could promote teamwork among group members and save the teacher time.

Future research should continue to explore the parameters in which dependent group contingencies are effective. If dependent group contingencies are more effective when there is a higher likelihood (e.g., 25%) of one's behavior contributing towards criteria relative to a smaller likelihood (e.g., 5%), at what point does that relation break down occur? Future research should systematically compare group sizes and likelihoods of contribution to determine the parameters in which dependent group contingencies are effective. For example, the behavior of a group of 10 with the three selected members could be directly compared to a group of 20 with six selected members. This comparison would afford an opportunity to evaluate group size disentangled from likelihood of selection. In the current study small group also had a higher likelihood of selection, which precluded such comparisons.

Several limitations of the present study should be noted. First, Table 2 details procedural fidelity scores for all conditions and classes. This information notes that procedures were not always conducted with 100% fidelity. For example, teachers from all three classes utilized an extra-experimental classroom contingency (Class Dojo) to reinforce appropriate behavior in at least one baseline session. Teachers also provided reprimands for problem behavior in at least

one intervention session. The teacher for Class 1 provided a reprimand during one small-group and one large-group dependent group contingency session, respectively. The teachers for Class 2 and Class 3 both provided a reprimand following problem behavior during one large-group dependent group contingency session. Future research should ensure other contingencies, which may affect participant behavior, are not in place during research sessions, or systematically evaluate the additive value of such contingencies.

Second, procedural fidelity measures did not include an evaluation of teacher accuracy in determining if selected students met criteria. This limitation occurred as an artifact of the data collection strategy. During transitions, the researcher recorded via video the behavior of all pertinent students in the hallway (i.e., students each respective classroom). While all students were visible for scoring elopement, only a portion of the class was visible enough to provide accurate scoring of talking or touching behavior. If students in the back half of the line were talking quietly, touching walls or classmates, their behavior may not have been scored. It is, therefore, possible that the data underestimated the actual occurrence of problem behavior. Despite this limitation, IOA scores only fell below 80% in baseline sessions for Class 1, indicating that data collection was reliable, though potentially not accurate. Further, this confound occurred across all phases and conditions. Thus, the confound would not have had a differential impact on the data. Despite this fidelity issue, if teachers were not accurately providing feedback and delivering rewards, when earned, it is expected that the percent of intervals with observed behavior would be elevated across conditions, given that students were accessing rewards while engaging in problem behavior. This accidental reinforcement would not lead to the differentiated outcomes observed in Classes 2 and 3. It may, however, be an explanation for the lack of differentiation in Class 1.

Time constraints related to the school schedule presented a third limitation. The present study included three first-grade classes which had the same lunch schedule, resulting in delays to feedback and reward delivery. At the request of the school Principal, all three classes were transitioned back to their respective classrooms before any group received feedback. As a result, there was a 3-5 min delay between transition ending and feedback/reward delivery because all three classes did not arrive back to the classroom at the same time. Classes were always transitioned and recorded in the following order: Class 3, Class 1, and Class 2. Class 1 was transitioned back to the classroom and then waited for Classes 2 and 3, prior to receiving feedback and delivery of the reward, if earned. It is possible that this delay yielded a less potent connection between behavior exhibited during transitions and the reward. Future research should ensure a timelier delivery of the reward.

A fourth limitation of the study related to the social validity results. Two of the three teachers rated the large-group dependent group contingency as being more efficacious. Data were not shared with teachers until after the completion of the study and social validity assessments so as not to influence opinions. It is possible that if data were shared regularly with teachers, their ratings would have better matched the outcomes of the study.

Group contingencies afford researchers and practitioners an efficient and practical means for intervening on the problem behavior of multiple members of a group (Collins, et al., 2019). Dependent group contingencies only require that one or a small subset of the entire group meet criteria for the group to access a reward, potentially making it the most efficient group contingency type to implement. To date there has been limited research conducted to support applications of dependent group contingencies as a mechanism to change the behavior of groups larger than four (Page, et al., 2021) and no research has been conducted with groups larger than

12 individuals. The present study contributes to the research into group contingency applications and treatment of problem behavior in non-instructional settings by directly comparing the efficacy of a small- and large-group size dependent group contingency. Results indicated both contingencies decreased problem behavior, but small-group dependent group contingencies were more efficacious for the three classes of fourteen or greater students during hallway transitions.

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PRISMA 2009 Flow Diagram

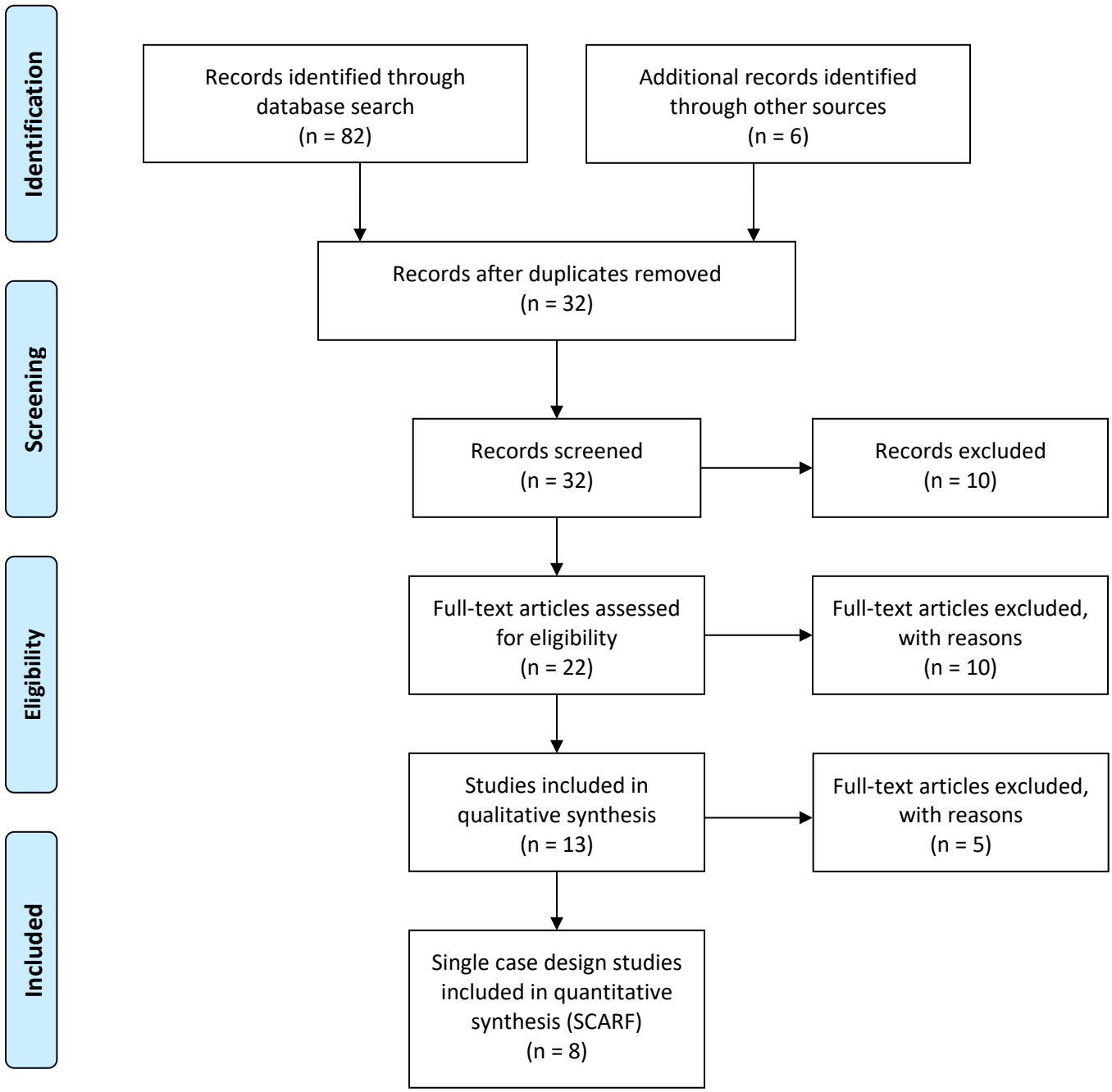

Figure 4. PRISMA flow-chart.

Article	Participant Grade Level Span	Setting	Research Design	Dependent Variable Type	Data Collector	Unit of Analysis	Group Contingency Type	Reinforcement or Punishment Types
Campbell & Skinner (2004)	Middle	Rural, public	Withdrawal*	Duration	Combination	Group	Interdependent	Reinforcement. Activities, edibles
Deshais, Fisher, & Kahng (2018)	Elementary	Urban, public	Multiple baseline	Rate	Researchers	Individuals	Dependent	Reinforcement. Edibles
Hawkins, Haydon, Denune, Larkin, & Fite (2015)	High	Urban, alternative	Withdrawal	Percentage	Researchers	Group	Interdependent	Reinforcement. Edibles, tangibles, activities
Hawkins, Haydon, McCoy, & Howard (2017)	Middle	Not stated, Alternative	Withdrawal	Percentage	Combination	Group	Interdependent	Reinforcement. Edibles, tangibles, activities
Hine, Ardoin, & Foster (2015)	Elementary	Suburban, public	Withdrawal	Latency	Researchers	Individuals	Interdependent	Reinforcement. Activity
Kartub, Greene, March, & Horner (2000)	Middle	Rural, public	Withdrawal*	Decibels	Teachers, administrators	Group	Interdependent	Reinforcement. Activity
Leedy, Bates, & Safran (2004)	Elementary	Rural, public	Withdrawal*	Rate	Administrators	Group	Interdependent	Reinforcement. Attention

McArdle, McMahon, Ardoin, Trump, & Molony (2020)	Elementary	Suburban, public	Reversal	Duration	Researchers	Group	Interdependent	Reinforcement. Tangibles, activities
McDougale, Coon, Richling, O'Rourke, Rapp, Thompson, & Burkhart (2019)	Adolescents	Not stated, Residential	Modified reversal	Rate	Researchers	Group	Interdependent	Reinforcement. Edibles
Staub (1990)	Middle	Urban, public	Modified reversal	Rate	Not stated	Group	Interdependent	Reinforcement. Attention
Tyre, Feuerborn, Pierce (2011)	Combined middle-high	Not stated, school run by Bureau of Indian Education	Withdrawal*	Frequency	Teachers	Group	Interdependent	Punishment
VanMaaren, Daniels, Ignacio, McCurdy, & Skinner (2020)	Elementary	Urban, public	Multiple baseline	Rate	Researchers	Group	Interdependent	Reinforcement. Activities
Yarborough, Skinner, Lee, & Lemmons (2004)	Elementary	Urban, public	Withdrawal	Duration	Researchers	Group	Interdependent	Reinforcement. Activities, edibles

Table 6. Characteristics of studies included in qualitative analysis. *Note:* * = Case Study

	Deshais 2018	Hawkins 2015					
		Class 1 Ready	Class 2 Ready	Class 3 Ready	Class 1 Late	Class 2 Late	Class 3 Late
Element							
Rigor							
Reliability	3	3	3	3	3	3	3
Fidelity	2	1	1	1	1	1	1
Data Sufficiency	3	4	4	4	4	4	4
(Average Score)	(2.7)	(2.7)	(2.7)	(2.7)	(2.7)	(2.7)	(2.7)
Quality of Measurement							
Ecological and Social Validity	0	1	1	1	1	1	1
Participant Description	2	1	1	1	1	1	1
Condition Description	3	4	4	4	4	4	4
Dependent Variable Description	4	4	4	4	4	4	4
Stimulus Generalization	0	0	0	0	0	0	0
Response Generalization	0	0	0	0	0	0	0
Maintenance Measurement	0	0	0	0	0	0	0
(Average Score)	(1.3)	(1.4)	(1.4)	(1.4)	(1.4)	(1.4)	(1.4)
Outcomes							
Primary Effect	3	3	4	4	3	3	4
Generalization Effect	0	0	0	0	0	0	0
Maintenance Effect	0	0	0	0	0	0	0

	Hawkins 2017			Hine 2015			
Element	Class 1 Ready	Class 2 Ready	Class 3 Ready	P1	P2	P3	P4
Rigor							
Reliability	3	3	3	3	3	3	3
Fidelity	1	1	1	1	1	1	1
Data Sufficiency	2	2	2	4	4	4	4
(Average Score)	(2)	(2)	(2)	(2.7)	(2.7)	(2.7)	(2.7)
Quality of Measurement							
Ecological and Social Validity	0	0	0	2	2	2	2
Participant Description	3	3	3	2	2	2	2
Condition Description	4	4	4	4	4	4	4
Dependent Variable Description	3	3	3	4	4	4	4
Stimulus Generalization	0	0	0	0	0	0	0
Response Generalization	0	0	0	0	0	0	0
Maintenance Measurement	0	0	0	0	0	0	0
(Average Score)	(1.4)	(1.4)	(1.4)	(1.7)	(1.7)	(1.7)	(1.7)
Outcomes							
Primary Effect	3	3	3	4	3	4	3
Generalization Effect	0	0	0	0	0	0	0
Maintenance Effect	0	0	0	0	0	0	0

	McArdle 2020				McDougale 2019
	Class 1	Class 2	Class 3	Class 4	
Element					
Rigor					
Reliability	3	3	3	3	3
Fidelity	2	2	2	2	0
Data Sufficiency	1	3	4	3	1
(Average Score)	(2)	(2.7)	(3)	(2.7)	(1.3)
Quality of Measurement					
Ecological and Social Validity	1	1	1	1	2
Participant Description	3	3	3	3	3
Condition Description	4	4	4	4	4
Dependent Variable Description	4	4	4	4	4
Stimulus Generalization	0	0	0	0	3
Response Generalization	0	0	0	0	4
Maintenance Measurement	1	1	1	1	0
(Average Score)	(1.9)	(1.9)	(1.9)	(1.9)	(2.9)
Outcomes					
Primary Effect	2	3	3	3	3
Generalization Effect	0	0	0	0	4
Maintenance Effect	2	4	2	4	0

Element	Disruption	Staub 1990 Decibels	Detentions	VanMaaren 2020	Yarbrough 2004
Rigor					
Reliability	1	1	1	3	3
Fidelity	0	0	0	1	4
Data Sufficiency	3	3	3	4	2
(Average Score)	(1.3)	(1.3)	(1.3)	(2.7)	(3)
Quality of Measurement					
Ecological and Social Validity	0	0	0	1	1
Participant Description	1	1	1	2	2
Condition Description	3	3	3	4	4
Dependent Variable Description	4	4	4	4	3
Stimulus Generalization	0	0	0	0	0
Response Generalization	0	0	0	0	0
Maintenance Measurement	0	0	0	0	0
(Average Score)	(1.1)	(1.1)	(1.1)	(1.6)	(1.4)
Outcomes					
Primary Effect	3	2	1	3	3
Generalization Effect	0	0	0	0	0
Maintenance Effect	0	0	0	0	0

Table 7. Quantitative analysis SCARF results

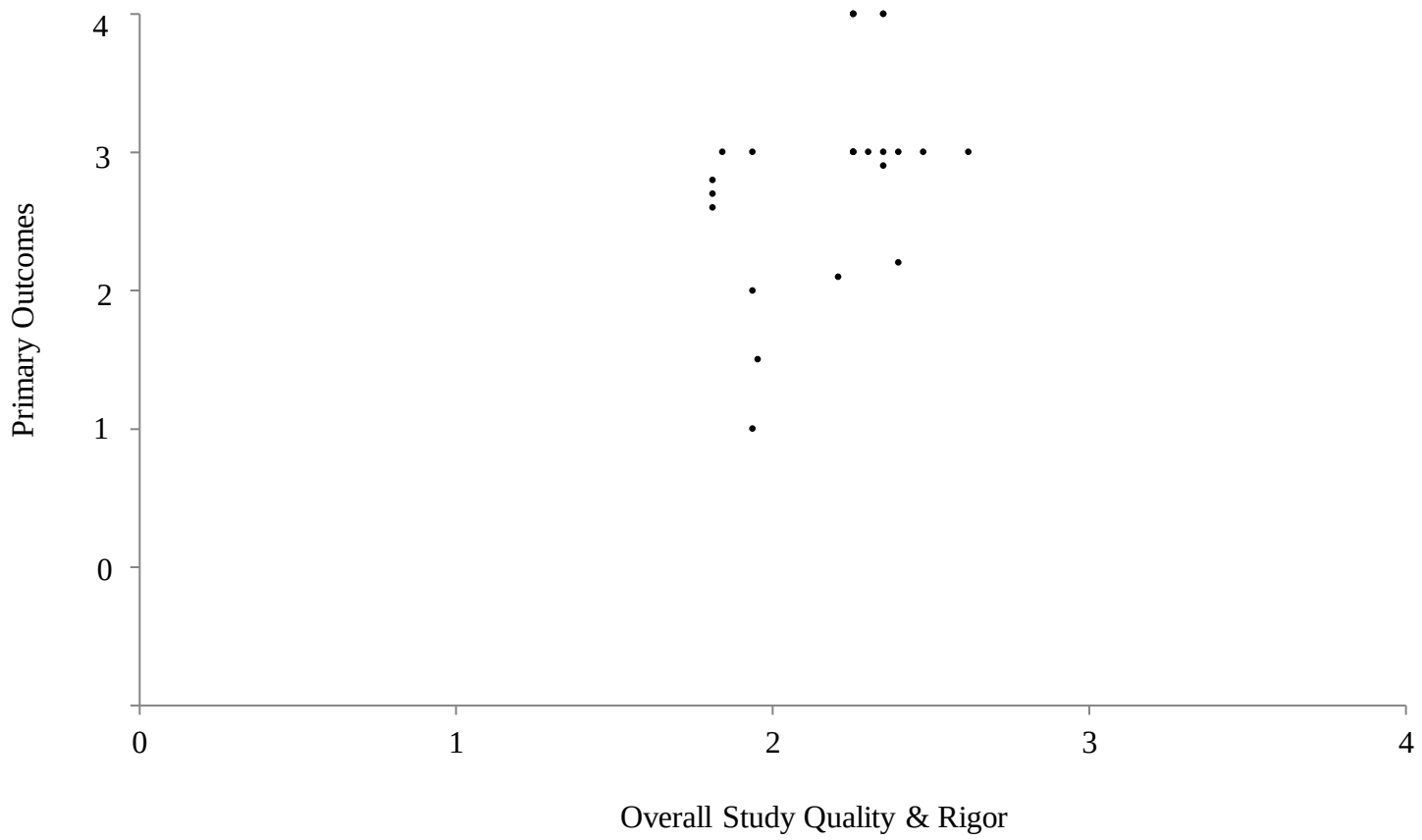

Figure 5. SCARF primary outcomes results.

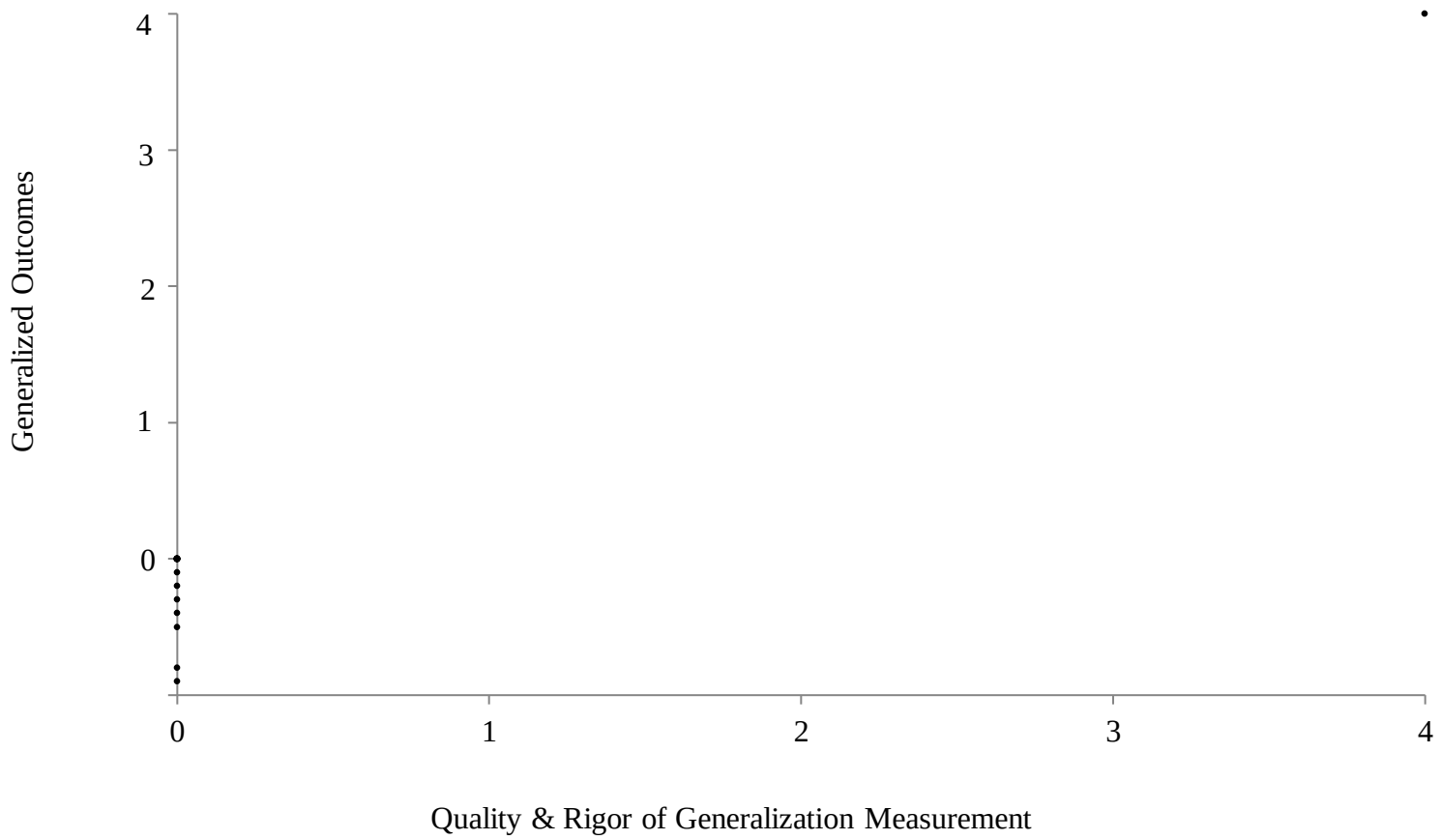

Figure 6. SCARF generalized outcome results.

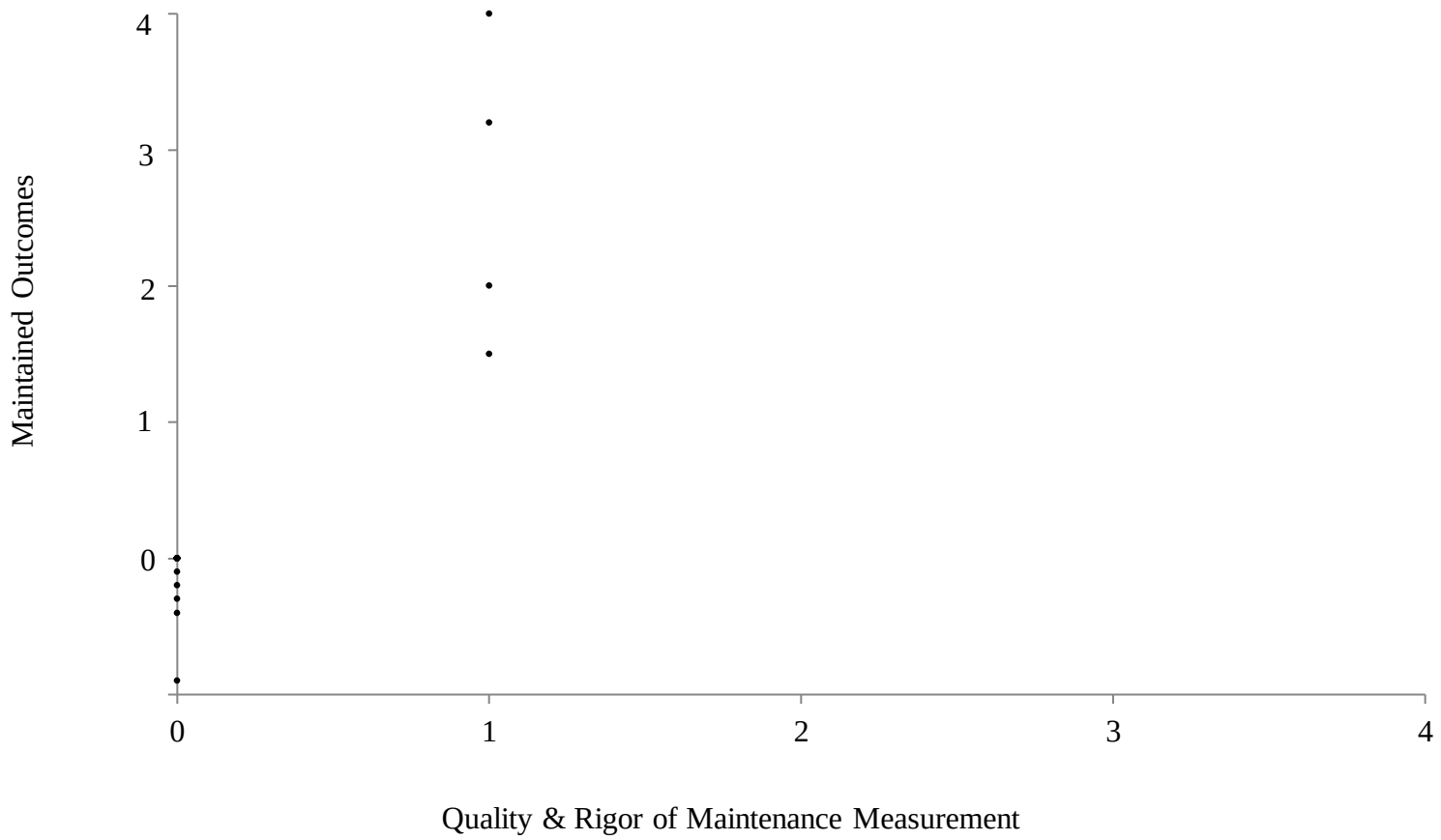

Figure 7. SCARF maintained outcome results.

Appendix A

Data Collection

Teacher:				
Interval (10s)	Transition 1		Transition 2	
1	+	--	+	--
2	+	--	+	--
3	+	--	+	--
4	+	--	+	--
5	+	--	+	--
6	+	--	+	--
7	+	--	+	--
8	+	--	+	--
9	+	--	+	--
10	+	--	+	--
11	+	--	+	--
12	+	--	+	--
13	+	--	+	--
14	+	--	+	--
15	+	--	+	--
16	+	--	+	--
17	+	--	+	--
18	+	--	+	--
19	+	--	+	--
20	+	--	+	--
Total +				
Percent with PBx				

Appendix B

Student Social Validity Survey

Please answer the questions.

1. Was the team game a fair?


No


yes

2. Was the class game fair?


No


yes

3. Did you like playing the team game?


No


yes

4. Did you like playing the class game?


No


yes

5. Did playing the team game help your class in the hallway?


No


yes

6. Did playing the class game help your class in the hallway?


No


yes

7. Which game did you like more?

   Team Game Class Game Same

8. Which game helped your class do better in the hallway?

   Team Game Class Game Same

Appendix C

Teacher Social Validity Survey

Please answer the following questions based on your perception of each game.

	Strongly Disagree	*Disagree*	*Slightly Disagree*	*Slightly Agree*	*Agree*	*Strongly Agree*
The team hero game is an acceptable intervention for problem behavior during transitions.	1	2	3	4	5	6
The class hero game is an acceptable intervention for problem behavior during transitions.	1	2	3	4	5	6
Most teachers would find the team hero game an appropriate intervention for problem behavior during transitions.	1	2	3	4	5	6
Most teachers would find the class hero game an appropriate intervention for problem behavior during transitions.	1	2	3	4	5	6
The team hero game was effective in improving transition behavior.	1	2	3	4	5	6
The class hero game was effective in improving transition behavior.	1	2	3	4	5	6
I would suggest the team hero game to other teachers to improve transition behavior.	1	2	3	4	5	6
I would suggest the class hero game to other teachers to improve transition behavior.	1	2	3	4	5	6

I was able to implement the team hero game correctly.	1	2	3	4	5	6
I was able to implement the class hero game correctly.	1	2	3	4	5	6
In the future, I would implement the team hero game again to improve transition behavior.	1	2	3	4	5	6
In the future, I would implement the class hero game again to improve transition behavior.	1	2	3	4	5	6

Final question:

Which game was more effective in improving the transition behavior of your students?

Team Hero Game Class Hero Game No Preference