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History and Evolution of the Good Behavior Game

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Abstract

The Good Behavior Game (GBG) was developed by Barrish, Saunders, and Wolfe in 1969 and soon became an often investigated classroom behavior management strategy, frequently reported in the literature as effective in reducing disruptive and off-task classroom behavior. Early research was characterized by pre-post observation or ABAB designs with small samples and short follow-up periods. These studies concentrated on replication, understanding the GBG's mechanisms of effectiveness, and extending the results to new populations and contexts. Although not implemented with the rigor, size, and duration of later studies, these trials set the foundation for the next stage of prevention research on GBG. A number of research groups beginning with the three generations of developmental epidemiologically based trials in the Baltimore Prevention and Education Program further developed the GBG as a preventive intervention in large-scale, population-based randomized field trials. Following the Baltimore trials were the Oregon Social Learning Center's "Linking the Interests of Families and Teachers" (LIFT) and a series of studies in the Netherlands, both of which also employed population-based randomized field trials. This later research has provided considerable evidence of the GBG's effectiveness as a preventive intervention that can significantly change the trajectory of children's problem behaviors, particularly males who were initially more aggressive.

1. Introduction

The Good Behavior Game (GBG) evolved out of the need to manage student behavior in classrooms simply and effectively. Barrish, Saunders, and Wolf first reported the GBG as a way to deal with inappropriate behavior in a regular fourth grade classroom identified as particularly disruptive by the classroom teacher and school principle (Barrish et al., 1969). In this first trial the GBG was targeted at behavior defined by the investigator with help of teachers as "out-of-seat" (i.e., a student leaving his/her seat without permission) and "talking-out" (i.e., talking without permission). Independent observers took baseline measurements of these student behaviors during both reading and math periods. Next the teacher explained to the class that they were going to play a game where the students would be divided into two teams, both eligible to win certain privileges if team members followed the classroom rules, which she verbally reiterated. The teacher further explained that when a team member broke a classroom rule, the whole team would receive a mark on the chalkboard. At the end of the game period, the team with the fewest marks, or both teams if neither had more than a preset number of marks, would win privileges such as victory tags, lining up for lunch early, and special projects at the end of the day. During the experimental phases, the GBG was first played during the math period, then during the reading period and finally during both the reading and math periods, creating multiple baseline and reversal phases. The results show decreased talking-out and out-of-seat behavior only during the periods when the GBG was implemented.

Following its development, researchers continued to study the GBG in efforts to replicate and extend its findings. Initially this research concentrated on examining the specific game components to understand the GBG's mechanisms of action. As these became clearer, publications focused on applying the GBG to other problem behaviors and to different students and settings. The successful use of the GBG has been frequently reported, with a published review of the literature by Tingstrom et al. (2006) on its implementation through 2002. Embry (2002) also discusses the use of the GBG as a possible "behavioral vaccine" to prevent subsequent problem behaviors. In all we found 25 papers in scientific journals on the early research of the GBG, 17 dissertations, and multiple publications on each of the three population-based randomized field trials all of which largely report positive results of the GBG. This paper elaborates on and appends the Tingstrom et al. (2006) review with emphases on the scientific rigor of the GBG research and more extensive and updated information on its evolution into a preventive intervention.

2. Purpose and Evolution of the Early Research on the GBG

2.1 Management of Targeted Behavior

Overall early implementation of the GBG was aimed at managing classroom behavior by decreasing particular student misbehavior and/or increasing appropriate behavior. Barrish et al. (1969) used the GBG to decrease out-of-seat and talking-out behavior and much of the early research addressed the same or similar disruptive, off-task actions. Some trials were also successful in using the GBG to target other behavior, such as writing skills and even oral hygiene (Maloney and Hopkins, 1973; Swain et al., 1982, respectively). As can be seen in Table 1, a number of these studies were motivated by a need to manage particular noncompliant students and/or classrooms with high levels of disruptive, talking-out, out-of-seat, and off-task behaviors,

which can inhibit instruction and learning. In an effort to emphasize good behavior, certain studies chose to focus on noting positive or appropriate student behavior rather than negative, disruptive behavior, while others added marks for good behavior and removed them for bad behavior (see Table 1).

2.2 Effective Components: Contingencies and Reinforcers

After early articles reported the effectiveness of the GBG, researchers began to examine components of the intervention, particularly the use of contingency strategies and reinforcers, to determine their necessity and impact on classroom behavior. See Tingstrom et al. (2006) for a more comprehensive review of different contingency strategies and behavioral reinforcers and their applications as well as advantages and disadvantages of other implementation elements.

Based on early literature, interdependent group contingency strategies like the GBG have been reported effective in managing behavior by relying on cooperation and conformity within the teams in light of the teacher's classroom rules. These strategies help reduce disruptive actions without requiring a teachers to individualize responses for each student's behavior. Results from this early body of research indicate that dividing the class into teams is more effective than either treating the entire class as one team or providing individual consequences for individual behaviors (Darch and Thorpe, 1977; Grandy et al., 1973; Gresham and Gresham, 1982; Harris and Sherman, 1973; Salend et al., 1989). When using the interdependent group contingency strategy of the GBG, several researchers did encounter reports of students who refused to play the game and continued to be disruptive (Barrish et al., 1969, Harris and Sherman, 1973; Hegerle et al., 1979; Johnson et al., 1978; Medland at Stachnik, 1972). Tingstrom et al. (2006) reviews suggestions for dealing with these students.

For all studies of the GBG, behavioral reinforcers given to the winning team(s) were natural to the classroom setting and included prizes, snacks, privileges, recognition, and special activities or events. These rewards generally suited the social and environmental context of each study; for example, a physical education teacher rewarded volleyball teams who met the daily point criteria with extra playing time (Patrick et al., 1998). Several trials specifically investigated the role of behavioral reinforcers in the GBG and reported that at least initially, concrete incentives are necessary in order to maintain the game's high level of impact on student behavior (Darch and Thorpe, 1977; Fishbein and Wasik, 1981; Harris and Sherman, 1973; Kosiec et al., 1986). The results from early research pointed to the utility of appropriate reinforcers maintained through a group contingency strategy to ensure effective behavior modification.

2.3 Studied Populations

Many of the early trials tested the GBG with a variety of children in a range of cultural settings, social contexts, and educational environments in efforts to extend the applicability of the GBG. Because it was first tested in a fourth grade classroom, initial GBG trials most frequently applied the game to regular elementary and middle school classes, with later application in more diverse environments. Tingstrom et al. (2006) reviews the individual ages, grades, and educational settings the research targeted. It is important to note that the GBG has been reported effective in varying geographic and

cultural contexts including rural, suburban, and urban environments within and outside the United States.

2.4 Involvement of Teachers and Schools

As the literature on the GBG became better known, school teachers and administrators undertook the implementation of this behavioral modification strategy to adapt it in accordance with the individual contexts of their schools or classrooms. Scientists as well as teachers and other education professionals coauthored a number of early articles on the GBG (see Table 1).

3. Quality of Science in Early Trials

Initially the *Journal of Applied Behavior Analysis* (*JABA*) served as the center for early research on the GBG, publishing many of the articles during the first fifteen years (see Table 1). These *JABA* articles are highly referenced in later studies, particularly Barrish et al. (1969), Medland and Stachnik (1972) and Harris and Sherman (1973). The research reported in *JABA* is generally more rigorous, with many trials implementing an ABAB design where after baseline measurements the intervention was conducted, withdrawn and then conducted again. Later as the GBG research progressed and diversified to different populations and contexts the results were reported in a greater variety of publications.

Among all the early investigations of the GBG, study design was divided between ABAB, pre-post observational, or variations and combinations of the two (see Table 1 and Tingstrom et al., 2006). The quality of these design ranges from several well-implemented ABAB designs to an observational study that tracked the behavior of one highly disruptive child in order to gauge the class' response to the intervention. The sample sizes also show large ranges, with some trials implementing the GBG in large classrooms, while others targeted smaller groups of only a few students (see Table 1). Study duration is another important marker of design quality, but it is difficult to accurately compare the study durations of these early trials because baseline periods and daily interventions lengths differed. For example, the GBG was implemented only once a week in some trials and several hours each day in others (see Table 1). All early trials of the GBG, however, lasted a portion of the school year, and a couple studies also included follow-up monitoring of targeted behaviors several months after the intervention (see Table 1). In summary, the GBG seemed to hold promise based on these studies, but the fairly small samples without randomization and short follow-up periods pointed towards the need for more rigorous tests with larger, defined populations and longer follow-up.

4. Results from Early Trials

Published data about the GBG is overwhelmingly favorable, repeatedly showing declines in targeted negative behaviors and/or increases in appropriate conduct during the intervention. This improved student behavior has reportedly allowed teachers to more effectively manage the classroom, praise appropriate behaviors and avoid spending time on ineffective and individualized discipline (Johnson et al., 1978; Philips and Christie, 1986). Several studies indicate there is a slight generalization of these improved behaviors into the class period following the intervention as well, but without the presence of the GBG the class gradually returns to baseline condition. This is

possibly due to the relatively short duration of GBG implementation in these early trials. At least one study reported that without continued mentoring and monitoring of teachers there was deterioration in effects (Johnson et al., 1978).

While the GBG reportedly improved behavior in these early studies, the GBG by itself did not appear to show significant direct impact on student academic performance in the classroom or other outcomes indirectly of interest, such athletic performance in context of a gym class (Harris and Sherman, 1973; Patrick et al., 1998). In their review of the GBG literature, Tingstrom et al. (2006) discusses how the GBG improved academically related behavior including assignment completion, accuracy, and creativity. Finally, none of the early articles reported any gender specific impacts, yet when particularly disruptive or non-compliant students were noted, they were overwhelmingly male.

5. Dissertations on the GBG

The early results of the GBG generated significant interest among graduate students and led to further replications as part of graduate doctoral work. The majority of these dissertations 1) directly replicated previous trials or altered the GBG to assess its effectiveness in academic and non-academic settings; 2) tested the game's components and transferability to non-standard settings; or 3) evaluated the impact of the GBG in comparison to other behavior management strategies (Adorno-Price, 1998; Auerbach, 1978; Bostow,1974; Clark, 1994; Gottshall, 1978; Grooms, 1974; Howard, 1997; Johnson, 1987; Levy, 2001; Patterson, 2003; Ramaekers, 2003; Solomon, 1982; Swiezy, 1989; Thornburg, 1984; Vogler, 1980; Warner, 1975; Washington, 1974; Wilander, 1975).

6. Transition to Randomized Controlled Prevention Trials in Baltimore

The reported results and continued interest in the GBG intervention spurred three generations of Baltimore-based trials beginning the mid 1980s and continuing in the current on-going trial. The research of the Baltimore Prevention and Education Program is grounded in a developmental epidemiological prevention trial strategy and the life course/social field theory, focusing on classroom behavior management in regular first and second grade classrooms (Brown and Liao, 1999; Kellam and Langevin, 2003; Kellam and Rebok, 1992; Kellam et al., 1999). The Baltimore prevention trials aim to reduce aggressive, disruptive behavior in the first grade, an antecedent for later antisocial behavior, violence, criminality, and substance abuse/dependence disorders. Instead of targeting particularly disruptive children as in the case of *indicated* or *selective* interventions, the universal Baltimore trials focus on changing the entire social context of the classroom and socializing the children to the new role of being a student during the transition from the home social field into the school and classroom social fields. The GBG is hypothesized to transform the nature of an aggressive, disruptive classroom by encouraging students to manage their own and their teammates' behavior through group reinforcement and mutual self-interest instead of the teacher having to develop individual strategies and address each child separately (Kellam et al., 2008, this issue).

6.1 First Generation Trials

The first generation of field trials was conducted in the 1980s and tested the GBG separately from Mastery Learning (ML), a curriculum-and-instruction program directed at reading achievement. The trial included three stages of randomization in its design (Kellam et al., 2008, this issue). First, in each of five urban areas with varying socio-economic levels and ethnicities, three to four similar schools were selected and randomly assigned to the GBG intervention, the ML intervention, or the control conditions. Second, within each of the 19 schools, children were assigned to first grade classrooms, which were balanced in size and took into account children's kindergarten performance. Finally, in the intervention schools, classrooms and teachers were then randomly assigned to intervention and control conditions. The control classrooms implemented Baltimore City's standard curriculum while in the GBG classrooms, the GBG intervention condition was implemented in addition to the City's standard first grade program.

Six to eight weeks after a baseline observation period, GBG teachers divided their classrooms into three heterogeneous teams and clearly posted classroom rules. When the GBG was played, teams whose members violated a classroom rule received a checkmark next to their name. Teams that did not exceed four check marks at the conclusion of the GBG period won the game. The GBG was played in phases, so it evolved from a procedure that was highly predictable and visible, with a number of immediate rewards, to a procedure with an unpredictable occurrence and location and deferred rewards.

When comparing children in GBG classrooms to control classrooms, the short term results indicated that students, especially males, within GBG classrooms had lower levels of aggressive, disruptive behavior (Dolan et al., 1993). By the spring of sixth grade, the GBG significantly decrease aggressive, disruptive behavior of males who were above median aggressive, disruptive levels during the fall of first grade (Kellam et al., 1994). By age 14, males in GBG intervention classrooms showed a strong reduction in smoking initiation as compared to controls (Kellam and Anthony, 1998). While the GBG appeared to be effective for highly aggressive, disruptive males, the intervention did not appear to as strongly impact the course of aggressive, disruptive behavior for females (Kellam et al., 1994; Kellam et al., 1998a and b).

In young adulthood, students in the GBG classrooms showed significant reduction in drug abuse/dependence disorders, alcohol abuse/dependence disorders, regular smoking, antisocial personality disorder, court records of juvenile delinquency and incarceration, suicide ideation and attempts, and use of services for problems with emotions, behavior, and drugs and alcohol compared to controls (Kellam et al., this issue, 2008; Petras et al., this issue, 2008; Poduska et al., this issue, 2008; Wilcox et al., this issue, 2008). This was particularly the case among the males rated as more highly aggressive, disruptive at baseline. A replication in the next cohort of first graders was carried out but with less mentoring and monitoring of teachers. Results revealed positive impact on drug abuse/dependence disorders and use of services (Kellam et al., 2008, this issue; Poduska et al., 2008,this issue). Non-significant effects were seen in the other young adult outcomes, although the impact was in the predicted direction (Kellam et al., 2008, this issue; Petras et al., this issue, 2008; Wilcox et al., this issue, 2008). The results from first and second grades, middle school, and young adulthood in this first generation of Baltimore trials of the GBG demonstrate that an intervention aimed at aggressive, disruptive classroom behavior prevented future negative

outcomes, particularly of an acting out and externalizing nature and especially for males with high levels of baseline aggressive, disruptive behavior (Kellam et al., this issue, 2008).

6.2 Second Generation Trials

While the first generation of Baltimore trials tested the GBG by itself, the second generation conducted in the early 1990s included the GBG coupled with an enhanced curriculum and instruction program. The hypothesis was that the combination of the GBG and enhanced academic instruction would result in improved behavior and achievement, possibly producing synergism and enhancing impact in both outcomes and broadening the population of children who benefited from higher aggressive, disruptive males to include both genders and those with less risk at the start of first grade.

The intervention was directed at improving teachers' instructional practices through curricular and instructional enhancements, strengthening the teachers' classroom management abilities with the implementation of GBG, and additional strategies for unresponsive children. The GBG used in the second generation was modified somewhat from the GBG used in the first generation. Points were given to a team for good/appropriate behavior and taken away for bad behavior. At the end of the game period points were exchanged for rewards, which were initially more tangible and then gradually replaced with social reinforcement over the school year. A separate family-school partnership intervention was also implemented in other classrooms within the same schools. This intervention was aimed at improving the behavior management and teaching practices of parents and their support of academic achievement, as well as strengthening the communication between parents and teachers through training in teacher and parent partnership building, weekly home-school activities, and a series of workshops for parents.

Nine Baltimore City schools participated in the second generation trial with one classroom in each school serving as a combined GBG and curriculum/instruction program (classroom-centered or CC), one as a family-school partnership (FSP) classroom, and one as the control or standard setting classroom in a randomized block design. As in the first generation, teachers and students were randomly assigned to classrooms. In the spring of first and second grade the CC intervention had a greater impact on aggressive, disruptive behavior, and poor achievement, especially in classrooms where the CC was well implemented and for males with higher teacher ratings of problem behavior at baseline (Ialongo et al., 1999). In the spring of sixth grade, the CC intervention showed a greater reduction in teacher-rated conduct problems, diagnoses of Conduct Disorder, school suspensions, and lower use of mental health services (Ialongo et al., 2001). The CC intervention also reduced smoking, replicating the impact seen in the first generation (Storr et al., 2002; Furr-Holden et al., 2004).

6.3 Third Generation Trials

In the current third generation of Baltimore randomized field trials, the GBG serves as one of three intervention components of the Whole Day First Grade Program (WD). WD builds on the earlier two generations of research by focusing on student mastery of first grade behavioral and achievement outcomes through: 1) effective

instructional practices by improving how teachers teach with emphasis on precision of delivery in reading instruction, 2) classroom behavior management using the GBG, and 3) family-classroom partnerships by engaging parents or other caregivers in their child's learning and behavior in structured activities at home, in the classroom, and through dedicated weekly telephone messages by the teachers. In this way parents have the opportunity to respond directly to teachers via phone or in person. This last element was part of the LIFT program tested in Oregon described below. By combining the GBG with interventional components aimed at academic achievement and now family-classroom partnerships, this third generation presents the question of whether the combination would produce synergistic, merely additive, or even redundant effects. In addition to testing the effectiveness of WD by following three cohorts of children through third grade, the research also examines what institutional training and support mechanisms are needed to sustain the intervention practices with fidelity through consecutive cohorts of children, moving towards the next stage of research beyond testing effectiveness to dissemination of effective programs system-wide.

7. GBG as a Component of the LIFT Intervention in Eugene, Oregon

In addition to the three generations of the Baltimore randomized field trials, the GBG has been a component of another large population-based randomized field trial designed to target similar early antecedents of later problem outcomes through a multi-level preventive intervention in elementary schools (Eddy et al., 2000, 2003, 2005; Reid and Eddy, 2002; Reid et al., 1999; Stoomiller et al., 2000). The LIFT (Linking the Interests of Families and Teachers) program, aimed at preventing conduct problems in neighborhoods, was designed for first and fifth grade students and their families who resided in an Oregon neighborhood noted for its high rates of juvenile delinquency. Thirty-two first and fifth grade classrooms containing a total of 671 children were randomized into intervention and control conditions. By focusing on three key social domains (i.e., the children's home setting, classroom, and playground environments) this intervention aimed at reducing the antecedents that lead to oppositional defiant disorder (ODD) and conduct problems.

In order to manage and improve student behavior, particularly learning to be part of a team, the portion of the LIFT program conducted on the playground utilized an adapted version of the GBG that was played for ten weeks. Each classroom was divided into small teams that served as the children's teams on the playground. Individual group members received armbands for positive playground behavior and negative behavior was also marked. At the conclusion of the playground period, teachers rewarded the entire class if enough armbands were collected for positive behavior. Individual teams were also rewarded if they did not exceed an allotted number of negative behaviors (Reid, et al, 1999).

The GBG had a significant effect on the level of aggression among students on the playground during the ten-week intervention period (Reid et al., 1999). Independent observation post-intervention showed both first and fifth grade students in the GBG condition had a significant decrease in physical aggression on the playgrounds as compared to control children. This effect was strongest for students who were most at-risk at baseline, similar to the results of the Baltimore trials (Reid et al., 1999; Stoolmiller, et al., 2000). In the follow-up analyses, results focused on the first and fifth graders separately because the different outcomes variables. For the first graders, the

intervention students showed reduced severity of attention deficit disorder (ADD) behaviors (Eddy et al., 2000; Reid and Eddy, 2002). For the fifth graders, the GBG students showed significant delay in time of first police arrest, association with deviant peers, and extensive alcohol use, but not in initiation of tobacco or marijuana use (Eddy et al., 2003, 2005; Reid and Eddy, 2002).

8. GBG Trial in the Netherlands

Outside the United States, the GBG has also been tested as a preventive intervention in a population-based randomized field trial in the Netherlands (van Lier et al., 2004, 2005; Vuijk et al., 2006, 2007). This research focused on the development of attention-deficit/hyperactivity (ADH) problems and subsequent conduct and oppositional defiant (ODD), as well as antisocial behavior, association with deviant peers, and peer rejection in elementary school children (van Lier et al., 2004, 2005, respectively). Further analyses of the trial investigated prenatal maternal smoking and its relationship to ADHD (attention-deficit/hyperactivity disorder) symptoms and effectiveness of the GBG as well as physical and relational victimization and later major depressive disorder (MDD), generalized anxiety disorder (GAD), and panic/agoraphobia (Vuijk et al., 2006, 2007, respectively). These types of disruptive or antisocial behaviors are similar to the aggressive, disruptive targets in the Baltimore and Oregon trials. The Netherlands trial is also based on the concept of utilizing universal classroom-based interventions that target behaviors early in the developmental trajectory during the critically important transition from early childhood to elementary school in efforts to prevent later problem disorders.

In the Netherlands trial, classrooms of children from 13 schools in areas of Rotterdam and Amsterdam were randomly assigned to intervention or control conditions and baseline assessments of all children were made in the spring of first grade. The GBG was played in second and third grades and was adapted for better use in the Dutch school system (e.g., children worked with the teacher to decide on classroom rules and rewards). In the GBG classrooms, students were assigned to heterogeneous teams and each team was given a number of cards, one of which was taken away for each violation of a classroom rule. At the end of the game period, teams with one or more cards remaining received rewards such as teacher complements, stickers, or weekly and monthly rewards if multiple games were won. Similar to the Baltimore trials, the GBG was played in phases including an introduction, expansion and generalization stage.

By the spring of third grade, the GBG had a significant effect on reducing the development of ADH problems overall (van Lier et al., 2004). General growth mixture modeling identified three developmental trajectories of ADH, ODD and conduct problems: a class with high levels of disruptive problems, a class with intermediate levels, and a class with low levels (van Lier et al., 2004). The GBG students exhibiting the highest level of disruptive problems at baseline saw the greatest decline in conduct problems during the intervention by the spring of third grade compared to controls. In regard to ADH problems in contrast to conduct problems, the GBG intervention had the strongest impact on those with intermediate baseline levels of problems (van Lier et al., 2004). Following the student's developmental trajectories of antisocial behavior through age 10 revealed the GBG had the strongest effect in reducing antisocial behavior among the class with the highest baseline antisocial behavior ratings (van Lier et al.,

2005). This reduction was also associated with lower levels or peer rejection and reduced affiliation with deviant peers (van Lier et al., 2005). The GBG also significantly reduced ADHD development and smoking experimentation by age 11 among students not exposed to prenatal smoking, while the effect of the GBG on exposed students was not significant (Vuijk et al., 2006).

In later analyses it was hypothesized by the Netherlands group that the GBG would reduce rates of physical and relational victimization which are linked to internalizing problems such as depression and anxiety (Vuijk et al., 2007). Overall GBG students had significantly reduced physical and relational victimization by age 10 as well as major depressive disorder (MDD), generalized anxiety disorder (GAD), and panic/agoraphobia by age 13 (Vuijk et al., 2007).

In the first reported results from the Netherlands GBG trial, the teacher who implemented the GBG also rated the disruptive behavior of students within their classroom therefore s/he was not blind to the intervention status possibly causing under- or over-reporting of behavior. As the students progressed through subsequent grade levels this problem of confounding was reduced by the fact that peer, self, and parental ratings were also utilized thereby increasing confidence in independence from the intervention.

9. Conclusion

Early observational and ABAB designed studies of the GBG intervention set the stage for the development of the current randomized field trials of the GBG. Developing, refining, and testing key elements of the GBG, these studies reported the positive immediate results of the intervention. Results from the first generation of Baltimore randomized field trials support the conclusion that the GBG by itself transforms the classroom environment and positively alters the growth trajectories of high risk children. The second and third generations test the GBG in the context of multi-component interventions, targeting classroom behavior and academic achievement as well as family-classroom partnerships. Randomized trails in Oregon and the Netherlands also support the use of the GBG intervention for reducing later maladaptive and antisocial outcomes. The three independent replications in different cultures, communities, and social contexts using population-based randomized designs have all reported positive impact on the GBG on a profile of externalizing, antisocial outcomes. These results greatly strengthen the promise of the GBG as an effective preventive intervention, leaving additional replication, expansion to broader portions of the population beyond the higher risk children, and going to scale as the frontiers of further research.

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Table 1. Early Observational Trials of the Good Behavior Game

Publication	Design	n	Study Duration	Published in JABA	Teacher Coauthor	Problem Individuals/ Classroom	Test of Contingency	Test of Reinforcers	Neg/Pos Behavior
Barrish et al., 1969	ABAB	24	58 days	Y	N	Y	N	N	–
Medland and Stachnik, 1972	ABAB*	28	55 days	Y	Y	N	N	N	–
Grandy et al., 1973	ABAB*	28	40 days	N	N	N	Y	N	–
Harris and Sherman, 1973	Pre-post	50	133 days	Y	N	N	Y	Y	–
Maloney and Hopkins, 1973	Pre-post	14	17 days	Y	N	N	N	N	+
Robertshaw and Hiebert, 1973	ABAB*	24	3 weeks	N	N	Y	N	N	+
Bostow and Geiger, 1976	ABAB	31	NF	N	N	N	N	N	–
Darch and Thorpe, 1977	ABAB*	10/27	27 days	N	Y	Y	Y	Y	+
Warner et at., 1977	ABAB	100	25 days	Y	N	N	N	N	–
Johnson et al., 1978	Pre-post	31	71 days, F/U	N	N	Y	N	N	–
Hegerle et al. 1979	Pre-post	22	31 days	N	Y	N	N	N	–
Huber, 1979[a]	Pre-post	13	33 days	N	N	Y	NF	NF	–
Lutzker and White-Blackburn, 1979	ABAB*	4	NF	N	N	N	N	N	+
Fishbein and Wasik, 1981	ABAB†	25	1 time/wk, 13 wks	Y	N	Y	N	Y	+
Gresham and Gresham 1982	ABAB*	12	40 days	N	Y	N	Y	N	–
Swain et al., 1982	Pre-post	45	≈23 days, F/U	Y	N	N	N	N	–
Saigh and Umar, 1983	ABAB	20	25 days	Y	N	N	N	N	–
Darveaux, 1984	ABAB	2/24	20 days	N	N	Y	N	N	+/–
Kosiec et al., 1986	Pre-post	54	40 days	N	Y	N	N	Y	–
Philips and Christie, 1986	Pre-post	1/28	25 days	N	N	Y	N	N	+
Salend et al., 1989	ABAB	19	28-29 days	N	Y	Y	Y	N	–
Webster, 1989	Pre-post	7	NF	N	N	N	N	N	+/–
Swiezy et al., 1992	Pre-post	4	20-21 days	N	N	Y	N	N	+
Patrick et al., 1998	Pre-post	67	20 lessons	N	Y	N	N	N	+/–
Davies and White, 2000	ABAB*	30, 20	30 days	N	N	N	N	N	–

[a]Publication in German, only English abstract available
ABAB*=variation of ABAB design
ABAB†=ABAB design not fully executed
NF=variable was not found
F/U=follow up