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A Synthesis of the Daily Behavior Report Card Literature from 2007 to 2017

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Daily behavior report cards (DBRCs) have shown to be effective in addressing academic and behavioral challenges for a variety of students in past literature. The purpose of this literature review and analysis is to update and summarize findings on the use of DBRCs on academic and social behavior for students considered to have disruptive behaviors or identified with disabilities. We identified eleven studies in the literature examining DBRCs with 390 participants with attention-deficit hyperactivity disorder, specific learning disabilities, emotional behavioral disorders, speech and language, multiple disabilities, other health impairments, or considered to have disruptive behavior in Pre-K through sixth grade academic settings. We also calculated effect sizes overall for each study and student-based characteristics. Findings suggest that using DBRCs have a range from weak to strong impact on the academic and social behaviors of students considered to have disruptive behaviors or students with disabilities in classroom settings. We present implications for research and practice.

Keywords: Daily behavior report cards, behavior management, disabilities

Despite seemingly insurmountable obstacles, many teachers have been able to successfully use practices that reduce inappropriate behavior, improve academic learning, and enhance social and interpersonal relationships in the classroom (Cheney et al., 2009). The research literature indicates a number of interventions have strong efficacy in changing academic and social behavior of students with challenging behaviors. For example classroom-level positive behavior supports (Reinke, Herman, & Stormont, 2013), group contingencies (Cariveau & Kodak, 2017; Little, Akin-Little, & O'Neill, 2015), and self-regulation strategies (Axelrod, Elizabeth, Haugen, & Klien, 2009; Graham-Day, Gardner, & Hsin, 2010) have all been shown to have positive effects on academic and social behaviors.

Daily Behavior Report Cards

One intervention that has been

shown in past research to have potential to modify students' academic and social behaviors is daily behavior report cards (DBRCs; Vannest, Davis, Davis, Mason, & Burke, 2010). Daily behavior report cards are tailor-made rating forms used to appraise target behaviors of individual students on a daily basis, provide feedback to the students on his or her performance, increases home-school communication, and deliver reinforcement contingent on student behavior. The adaptability, simplicity, and the inexpensive nature of DBRCs, make them an efficient and easy way to provide direct feedback about changes in a student's academic and social behaviors (Chafouleas, Riley-Tillman & McDougal, 2002).

Historically, DBRCs have been shown to have positive impacts on academic and social behaviors for students with disabilities. Previous investigations show DBRCs that incorporate timely and specific feedback delivered in school and at home have a positive effect on changing student behavior (Barth, 1979). Atkeson and Forehand (1979) reported that DBRCs are effective in changing classroom behaviors across a range of classrooms, settings, and target behaviors.

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Researchers use a wide range of characteristic when creating DBRCs. Common characteristics can be discussed despite variability in their definitions: (a) specification of target behavior(s), (b) daily rating of target behavior(s) occurrence, (c) sharing obtained information across individuals (e.g., parents, teachers, students), and (d) using DRBCs to monitor the effects of an intervention and/or as a component of an intervention (Chafouleas et al., 2002). A number of components identified in the literature to be considered when creating DBRCs have been reported to be effective: (a) operationally defined target behavior or constellation of behaviors, (b) rating of behaviors using simple numbers or symbols that are integrated in the behavior scales (c) daily monitoring of behaviors, (d) feedback provided to students on their behavior(s), and (e) communicating performance of DBRCs between the student's teacher and home (Chafouleas et al., 2002; Chafouleas, Riley-Tillman, Sassu, LaFrance, & Patwa, 2007; Long & Edwards, 1994; Riley-Tillman, Chafouleas, & Briesch, 2007). However, features to be included for the successful implementation of DBRCs have yet to be agreed upon. While past research states DBRCs are effective interventions, the approach to developing and implementing a DBRC is discussed with much variability. A review of current literature is needed to examine the necessary components of a DBRC and its efficacy as an intervention.

Previous Reviews

Daily behavior reports cards have been reported to be an effective intervention for increasing desired academic and social behaviors of students with disabilities and students considered to

have disruptive behaviors (Atkeson & Forehand, 1979; Barth, 1979; Burke & Vannest, 2008; Chafouleas et al., 2002; Smith et al., 1983; Vannest et al., 2010). The most recent review of DBRCs involved a meta-analysis of single-case research (Vannest et al., 2010). Vannest and colleagues (2010) analyzed 17 single-case research design studies, from 1970 to 2007, involving 107 participants dating to 2007. They reported a broad range in effect sizes for interventions (*range* = -0.14 - .97) using improved rate difference (IRD) as the meta-analytic measure. The mean effect size for all studies was 0.61 83% CI [.56, .66]. This can be interpreted as follows: on average, DBRC intervention study data showed a 61% improvement rate from baseline to intervention phases on a range of outcomes and the authors are reasonably certain the range of improvement is within 56% to 66% (Vannest et al., 2010). Since the review by Vannest et al. (2010) only included single-case design research, group designs have not been examined comprehensively. In the ten years since the most recent review, group design research on DBRCs has increased, warranting further investigation and analysis of effectiveness.

This literature review and analysis examines group design research on DBRCs from 2008 to 2013 and single-case design research since 2007 to investigate the following overall research question: How effective are DBRCs on academic and social behaviors of students considered to have challenging academic and social behaviors? We developed the following sub-questions to answer the research question: (a) What are the characteristics (e.g., study design, setting, disability categories) of studies that examined the use DBRCs for students considered to have challenging academic and social behaviors? (b) Are there specific components that should be included in a DBRC? (c) How effective are DBRCs on academic and social behaviors for students with disabilities or disruptive behaviors as reported by individual research studies? (d) When examining studies of DBRCs for students with disabilities or challenging academic and social behaviors, how many single-case and group design quality indicators are met? To this end we calculated effect size analyses of DBRCs used in classrooms to support students with disabilities academic and social behaviors. It is also the intention of this review to examine study characteristics (e.g., settings, grade level, disability categories), identify components that should be included in developing a DBRC, examine the effectiveness of DBRC in the identified literature, and analyze the quality of the identified studies.

Methods

Search Procedures

We searched multiple databases for single-case and group design research articles; particularly, single-case design research studies published after September 2007. We selected the date restriction due to a comprehensive meta-analysis published in 2010 by Vannest and colleagues that identified articles up to September 2007. Our purpose is to identify single case research from September 2007 to August 2017 to examine their effectiveness in modifying behavior as well as identifying specific components of DBRCs since the last single-case literature review. We set no criteria for year of publication for group design articles. We conducted our review of group design articles through early August 2017. We conducted searches in the following electronic databases: PsycINFO, Educational Resources Information Center (ERIC), and ProQuest

Educational Journals. We entered the following search terms in descriptor field boxes individually or in combination by employing Boolean operators using the following key terms: *daily behavior report card(s), disability, daily report card(s), DBRC, home school note, home school communication*.

The initial search resulted in identification of 84 articles after omitting duplicate articles. An ancestral search of identified articles resulted in one additional article being qualifying for our review (*n* = 85). We examined titles, abstracts, and methods sections of identified articles to identify articles meeting inclusion criteria reducing the number of identified articles to 11. We identified three single-case research design articles and eight group design articles for inclusion in this review and analysis. A Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA; Moher, Leberati, Tetzlaff, & Altman, 2009) flow diagram on search procedures is provided in Figure 1.

Criteria for Selecting DBRC Studies

We used the following inclusion and exclusion criteria to identify articles that qualified for this review. In order to qualify for this review articles had to:

1. Investigate the impact of a DBRC intervention on academic and social outcomes for students with disabilities or considered to be at risk.
2. Be empirical group or single-case research designs.
3. Have been published between September 2007 and August 2017 if the studies used single-case methodologies.
4. Have published prior to August 2017 if the studies used group design methodologies.
5. Have participants identified as students considered having challenging academic or social behaviors in Pre-K through 12th grade, academic settings with teachers being identified as pre-service or in-service special education teachers.
6. Explicitly describe the use of DBRCs to increase or decrease student academic or social behaviors.
7. Be published in English language peer-reviewed journals.

We excluded articles if they:

1. Did not explicitly investigate DBRC effectiveness in changing academic or social behaviors.
2. Examined observation methods for rating the student behavior (e.g., direct behavior rating scale, systematic direct observation) rather than DBRC outcomes.
3. Focused on check-in/check-out. Check-in/check-out differs from DBRCs due to an individual (e.g., principal, teachers) other than the student's primary teacher at school being the point person for the intervention. DBRCs rely on the parent as the point person for the intervention.
4. Were not empirical group or single case-research designs.

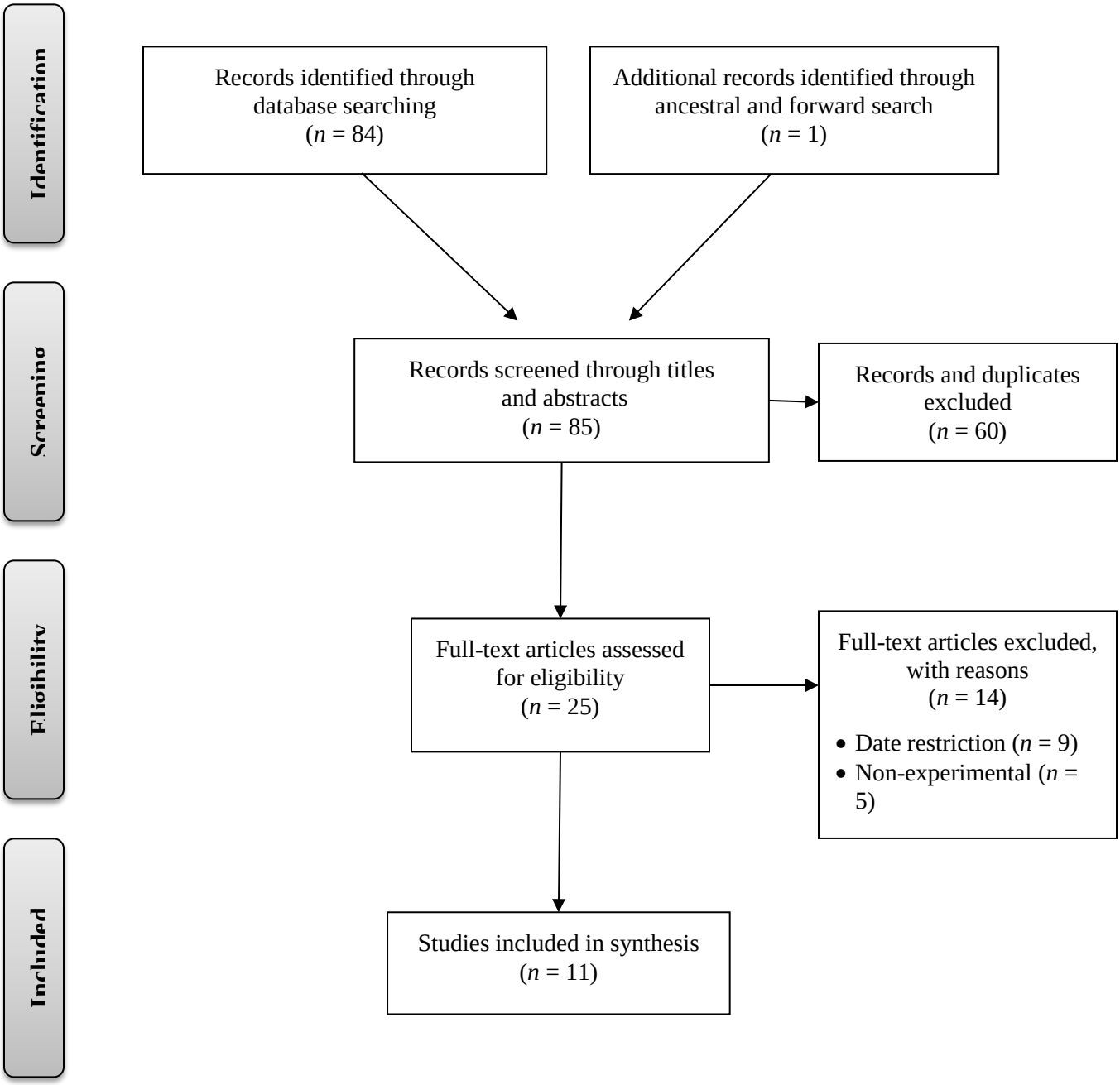

Figure 1. PRISMA flow diagram of search process

Study Coding

Our systematic review yielded 11 articles meeting inclusion criteria. We then coded each study based on number of participants, disability categories, dependent variables, academic settings, home communication, research design, grade level, feedback, and the identification of target behaviors. We coded participants and dependent variables verbatim using the number of students reported in each study and descriptive information respectively. We coded students from each study based on their disability identification or status as disruptive (i.e., *specific learning disability, emotional behavior disorder, attention deficit hyperactivity disorder, multiple disorders, other health impairment, 504 plan,* and *disruptive behavior*). We identified three settings DBRCs were being implemented in the literature (i.e., *general education classrooms*, *resource classrooms,* and *self-contained classrooms*). We examined each study to determine if home communication and feedback were components of the DBRC intervention respectively (i.e., yes or no). Based on the studies qualifying for this review, we found only two grade levels (i.e., elementary and pre-k). Authors implemented DBRCs using two methods (i.e., *electronic* and *paper*). We extracted target behaviors from each study and categorized them according to how each study described target behaviors (i.e., *on-task behavior, classroom rule violations, academic achievement and productivity, attention, work completion, disruptive behaviors, attention, deportment, and impulse control*). Lastly, we identified each study as either a single-case or group research design.

Data Coding

First, we extracted data from plots in single-case research design studies using the Web Plot Digitizer (Rohatgi, 2015) web based application. Using the Web Plot Digitizer allows data to be extracted and digitized from existing plot images to reduce error in extracting numerical data. We calculated effect sizes for each single-case research design study. Additionally, we examined text and data tables for each group design study for means, standard deviations, and number of participants that we used to calculate effect sizes.

Second, we used Tau-*U* (Parker, Vannest, Davis, & Sauber, 2011; Vannest, Parker, & Gonen, 2011) to calculate effect size for all single-case research design articles. We calculated one overall effect size for each study regardless of design type. We did not include maintenance data in Tau-*U* calculations. Tau-*U* is used to show the percentage of non-overlap between phases or percentage of data showing improvement between phases. Tau-*U* is calculated using the formula: Tau-*U* = S / number of pairs (Parker, Vannest, & Davis, 2011). The number of pairs is calculated as the product of two Phase *N*s and Kendall's rank correlation outputs Kendall's score representing S in the formula (Parker et al., 2011). Tau-*U* scores can be interpreted using the following criteria: .65 or lower: weak or small effect; between .66 and .92: medium to high effect; and .93 to 1: large or strong effect (Parker & Vannest, 2012; Rakap, 2015). Authors reported effect sizes in one article (Chafouleas et al., 2007) using a standardized difference approach to examine effectiveness across raters (*range* = .37 - .73).

Third, we calculated effect sizes for all group design studies using Hedge's *g* so a common metric could be utilized for comparison across studies. We used Hedge's *g* to account for the overestimation that occurs when calculating effect size

using studies with small sample sizes (Hedges, 1981). Hedge's *g* is calculated using the formula: $g = M_1 - M_2$ / Pooled Standard Deviation (Ellis, 2009). Hedge's *g* effect sizes can be interpreted using the following criteria: .50 or lower: small effect; between .50 and .80: medium effect; .80 to 1: large effect (Cohen, 1988).

Last, we conducted a visual analysis of data provided in the identified single-case research articles. Visual analysis of data as the process for reaching a judgment about reliable or consistent intervention effects by visually examining graphed data (Kazdin, 1982). Specifically, we visually analyzed graphs for level, trend, and variability.

Research Design Quality Indicators

Gersten et al. (2005) suggest that quality indicators are to be used to define acceptable and high-quality research proposals and studies. We examined each study for quality research indicators as appropriate. We individually assessed single-case research studies identified in this review using quality indicators of single-case research design. In order to assess quality indicators, we created a rubric based on the Horner et al. (2005) paper on single-case quality indicators. We used the quality indicators to judge the quality of single-case research by examining descriptions of participants and settings, dependent variables, independent variables, baseline procedures, internal validity, external validity, and social validity (Horner et al., 2005). We also assessed group design articles identified in this review individually using essential and desirable quality indicators presented by Gersten et al. (2005) for experimental and quasi-experimental research. Using the Gersten et al. (2005) paper, we created a rubric to assess the quality of group design articles. We used group design quality indicators to evaluate articles by examining descriptions of participants, independent and dependent variables, and the results presented in the study. Single-case and group research is a rigorous, scientific methodology used to define basic principles of behavior and establish the reliability and validity of the effectiveness of an intervention (Gersten et al., 2005; Horner et al., 2005). We included articles regardless of quality indicator results.

Inter-coder Agreement

Two doctoral students participated in inter-coder agreement in four areas: study characteristics, data extraction, effect size analysis, and research design quality indicators. We trained a doctoral student who was naïve to the purpose of the study on study coding procedures in order to independently extract study characteristics from six randomly selected studies (54% of studies). Initial agreement on study characteristics reached 85% (46/54 agreements). We achieved 100% agreement after additional training and discussion occurred. Agreement across study characteristics is as follows: participants - 83% (5/6 agreements); disability category - 100% (6/6 agreements); dependent variable – 67% (4/6 agreements); academic setting – 83% (5/6 agreements); home communication – 83% (5/6 agreements); research design – 100% (6/6 agreements); grade level – 100% (6/6 agreements); feedback – 83% (5/6 agreements); identifying target behavior- 67% (4/6 agreements). Details for initial disagreement are as follows: participant - due to oversight of participant information by the trained doctoral student; dependent variable - due to challenges deciphering between academic or behavior variables; academic setting, home communication,

feedback, and target behavior were due to oversights on the part of the trained doctoral student.

We trained the same doctoral student in data extraction procedures for group and single-case research design by the author. We provided the same six randomly selected studies (54% of studies) to the doctoral student to conduct independent data extraction. Initial agreement on group design data extraction reached 100% (4/4 agreements). Due to possible error in data extraction for single-case research design articles using the web plot digitizer (Rohatgi, 2015), reliability results had to be within +/- .05. Initial agreement on single-case research data extraction resulted in 100% (2/2 agreements) agreement. The same doctoral student also co-calculated effect sizes on the same six randomly selected studies using Tau-*U* and Hedge's *g* as appropriate. Initial agreement was 83% (5/6 agreements). After discussion and further training, 100% agreement was achieved.

We trained a second doctoral student who was naïve to the purpose of the study on coding research design quality indicators procedures. Initial agreement on single case research design quality indicators reached 100% (7/7 agreements). Initial agreement on group design articles reached 74% (46/63 agreements). After additional training 87% agreement was achieved.

Results

We examined eleven studies to identify the impact of DBRCs on social and academic behavior for students considered to have challenging academic and social behaviors. We summarized identified articles for review by their DBRC characteristics, the effectiveness of the studies, and the number of quality indicators met for single-case and group designs. A detailed summary of studies that qualified for this review is included in Table 1.

Table 1
Descriptive Variables of Interest

Author	# of Participants	Disability Categories	Dependent Variable	Identification of Target Behavior	Academic Setting	Home Communi-cation	Feed-back	Research Design	Grade Level
Chafouleas et al. (2007)	3	SLD, 504	On-task behavior	Operationally defined	General Ed	No	Yes	Single-case (AB)	Elementary
Fabiano et al. (2010)	63	ADHD	Classroom rule violations; WJIII Reading; WJIII Math; IRS; APRS Teacher rating of IEP goal improvement; Student teacher relationship scale	Operationally defined	General Ed Resource	Yes	Yes	Within Group	Elementary
Fabiano et al. (2009)	63	SLD, EBD, OHI, MD	Temporal stability across months	IEP	General Ed, Self-Contained & Resource	Yes	Yes	Within Groups	Elementary
Jurbergs et al. (2010)	43	ADHD, DB	Percent on task; Percent work complete; Percent work correct	Operationally defined	General Education	Yes	Yes	Between Groups	Elementary
LeBel et al. (2013)	4	DB	Disruptive behavior	Operationally defined	General Education	Yes	Yes	Single-case (Multiple Baseline)	Pre-K

Murray et al. (2008)	24	ADHD, 504	SKAMP; APRS	Impairment rating scale	General Education	Yes	Yes	Within Group	Elementary
Owens et al. (2012)	66	DB	Incremental effects across months	Operationally defined	General Education	Yes	No	Within Group	Elementary
Sanetti et al. (2016)	4	SLD	Academic engagement	Operationally defined	Resource	No	Yes	Single-case (Reversal)	Elementary
Vujnovic et al. (2013)	33	ADHD	Percent of adherence	IEP	General Education & Resource	Yes	No	Between Group	Elementary
Watabe et al. (2013)	41	ADHD	DBD; IRS	University website	General Education	Yes	Yes	Within Group	Elementary
Williams et al. (2012)	46	DB	Percent of intervals of disruptive behavior; CBCL CRS-R ADHD Index; IRP-15	CBCL TRF; CRS-R	General Education	Yes	No	Within Group	Elementary

Note. ADHD = Attention Deficit Hyperactivity Disorder; APRS = Academic Performance Rating Scale; CBCL TRF = Child Behavior Checklist Teacher Report Form; CD = Conduct Disorder; CRS-R = Conners' Rating Scale Revised; DB = Disruptive Behavior; DBD = Disruptive Behavior Disorder Rating Scale; EBD = Emotional Behavioral Disorder; IEP = Individualized Education Plan; IRP-15; Intervention Rating Profile-15; IRS = Impairment Rating Scale; MD = Multiple Disorder; ODD = Oppositional Defiant Disorder; OHI = Other Health Impairment; SKAMP = Swanson, Kotkin, Agler, M-Flynn, & Pelham teacher report measure; SLD = Specific Learning Disability; WJIII = Woodcock-Johnson III Tests of Achievement

Descriptive Statistics on Study Characteristics

We calculated and reported descriptive statistics for the following study characteristics: participants, disability category, dependent variables, academic setting, grade level home communication, research design, feedback, and identification of target behaviors. Across all qualifying studies, we identified 390 participants as having disabilities or disruptive behavior in Pre-K through sixth grade academic settings. We grouped studies by disability categories: five studies (45%) examined students with ADHD (Fabiano et al., 2010; Jurbergs, Palcic, & Kelley, 2010; Murray, Rabiner, Schulte, & Newitt, 2008; Vujnovic, Fabiano, Pariseau, & Naylor, 2013; Watabe, Stewart, Owens, Andrews, & Griffeth, 2013); two studies (18%) examined specific learning disabilities (Chafouleas et al., 2007; Sanetti, Chafouleas, Berggren, Faggella-Luby, & Byron, 2016); five studies (45%) examined disruptive behavior or emotional and behavioral disorder (Fabiano, Vujnovic, Naylor, Pariseau, & Robins, 2009; Jurbergs et al., 2010; Lebel, Chafouleas, Britner, & Simonsen, 2013; Owens et al., 2012; Williams, Noell, Jones, & Gansle, 2012); one study (9%) examined speech and language, multiple disabilities, or other health impairment (Fabiano et al., 2009). See Table 2 for demographic information (i.e., gender, race) on a study-level basis.

Table 2

Study-Level Demographic Statistics

Author	Number of Participants	Gender	Race
Chafouleas et al. (2007)	3	3 Males	3 Hispanic
Fabiano et al. (2010)	63	91% Male; 9% Female	79% White; 13% African American; 8% Mixed Race
Fabiano et al. (2009)	63	86% Male; 14% Female	79% White; 13% African American; 8% Mixed Race
Jurbergs et al. (2010)	43	32 Males; 11 Females	43 African American
LeBel et al. (2013)	4	3 Males; 1 Female	2 White; 1 Hispanic; 1 African American
Murray et al. (2008)	24	71% Male; 29% Female	71% White; 29% African American
Owens et al. (2012)	66	58 Males; 8 Females	62 White; 4 Not Reported
Sanetti et al. (2016)	4	3 Males; 1 Female	4 White

Vujnovic et al. (2013)	33	91% Male, 9% Female	81.81%; White 18.19% Not reported
Watabe et al. (2013)	41	87.80%; Male; 12.2% Female	97.60% White; .40% Not reported
Williams et al. (2012)	46	37 Males; 9 Females	40 White; 6 African American

Research design. We identified three single-case research design studies (27%; Chafouleas et al., 2007; LeBel et al., 2013; Sanetti et al., 2016) and eight group design studies (73%; Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; Murray et al., 2010; Owens et al., 2012; Vujnovic et al., 2013; Watabe et al., 2013; Williams et al., 2012) for review.

Delivery and setting. We identified two methods for delivering DBRCs: traditional paper format (*n* = 10) and e-mail (*n* = 1). Settings for the 11 studies include: general education, resource, and self-contained classrooms (See Table 1).

Dependent variables. Dependent variables in the studies that use single-case research designs included that include on-task behavior (Chafouleas et al., 2007), disruptive behavior (LeBel et al., 2013), and academic engagement (Sanetti et al., 2016). Dependent variables in group design studies included social behaviors relating to ADHD, Oppositional Defiant Disorder (ODD), Disruptive Behavior (DB), conduct disorder as well as academic behaviors relating to mathematics and reading.

Components of DBRC

Target behavior identification. Authors identified target behaviors differently across studies. Authors used individualized education plans (IEPs) to identify target behavior and convert them to behavior scales on a DBRC (Fabiano et al., 2009; Vujnovic et al., 2013). Authors of one study identified target behaviors using frameworks provided by a university website (Watabe et al., 2013). Educators operationally defined target behaviors in 55% (*n* = 6) of studies identified in this review (Chafouleas et al., 2007; Fabiano et al., 2010; Jurbergs et al., 2010; Lebel et al., 2013; Owens et al., 2012; Sanetti et al., 2016). Authors used the Child Behavior Check List Teacher Report Form (CBCL-TRF) and the Conners' Rating Scale Revised (CRS-R) ADHD Index in one study (Williams et al., 2012) to identify target behavior. Finally, authors of one study (Murray et al., 2008) identified target behaviors using an impairment rating scale.

Feedback. Teachers met with students to provide feedback on their DBRC performance in 73% (*n* = 8) of studies (Chafouleas et al., 2007; Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; LeBel et al., 2013; 2010; Murray et al., 2008; Sanetti et al., 2016; Watabe et al., 2013). Authors of the identified articles provided feedback to students immediately after the observation period in 36% (*n* = 4) of studies (Chafouleas et al., 2007; Lebel et al., 2013; Sanetti et al., 2016; Watabe et al., 2013). Although authors provided feedback

in four additional studies (36%; Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; Murray et al., 2008), immediacy of the feedback was not explicitly stated.

Home-school communication. Teachers sent DBRCs home with the students providing feedback to parents on daily performance towards targeted goals via the DBRC. Eight studies (72%) paired home communication with paper DBRCs (Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; Lebel et al., 2013; Murray et al., 2008; Owens et al., 2012; Vujnovic et al., 2013; Watabe et al., 2013). Individuals implementing the intervention used e-mail to facilitate home communicate in one study (Williams et al., 2012). Individuals provided home-based reinforcement in 81% of studies utilizing home-school communication (n = 9) contingent on the student's performance at school).

Intervention Efficacy

Effectiveness of studies. For the three single-case research design studies, study level effects were small for two studies (Tau *U* = .51 and .65) and medium to large for one study (Tau *U* = .81). For the eight studies that used group designs, study-level effect sizes (Hedge's *g*) were very small or small for four studies (0.03, 0.14, 0.17, 0.29), small-to-medium for two studies (0.43, 0.47), and medium for two studies (.62, 0.72). The median study-level effect size equaled 0.36 (*range* = 0.03 to 0.72). See Table 3.

Table 3

Study-Level Effect Sizes and Corresponding Confidence Intervals

Study	Effect Sizes	
	Tau-*U* (95% CI)	Hedge's *g* (95% CI)
Single-case Studies		
Chafouleas et al., (2007)	0.5057 (0.0971 < > 0.9143)	
LeBel et al., (2013)	0.8102 (0.5352 < > 1.0852)	
Sanetti et al., (2016)	0.6516 (0.1801 < > 1.1231)	
Group Design Studies		
Fabiano et al., (2010)		0.1389 (-2.1962 < > 2.0181)
Fabiano et al., (2009)		0.6180 (-3.9770 < > 2.8190)
Jurbergs et al., (2010)		0.4347 (-7.1028 < > 6.1874)
Murray et al., (2008)		0.0287 (-1.8471 < > 1.8912)
Owens et al., (2012)		0.7225 (0.4280 < > 1.0168)
Vujnovic et al., (2013)		0.2919 (-7.4366 < > 8.0204)
Watabe et al., (2013)		0.1671 (-0.1280 < > 0.4620)
Williams et al., (2012)		0.4715 (-2.3511 < > 3.2712)

Note. CI = Confidence Interval

Visual analysis. Results of visual analysis were variable across single case studies. In all three participants in the Chafouleas et al. (2007) study we see a decreasing trend during baseline and an increase in level from baseline to intervention with minor variability. However, in two of the participants we see a decreasing trend during intervention. We see a functional relation in the data from baseline to intervention, yet the decreasing trend in intervention for two participants

may indicate issues in maintaining performance. Visual analysis of Lebel et al. (2012) shows minor variability with moderate to high levels of disruptive behavior. We see changes in level from baseline to intervention with little variability throughout intervention. The data shows a clear functional relation between baseline and intervention across all participants. Visual analysis of Sanetti et al. (2015) data shows high levels of engagement across four participants with three participants already at the 80% goal before implementation of intervention. Little change in level is noted from baseline to intervention through all phases of the reversal design other than one participant (Jake). Results indicate that behaviors were fairly stable with little variability across participants during intervention but did not reverse when intervention was withdrawn. Because the data remained at the same level when intervention was withdrawn we cannot say there was a functional relation between independent and dependent variables. Three of the four participants were already at the goal before intervention implementation and we do not see significant change in the data from baseline to intervention. Additionally, a doctoral student with experience in visual analysis conducted reliability on single-case graphs. Reliability was 100%.

Research Design Quality Indicators

Single-case design research quality indicators. Quality indicators focus on clearly describing participants, settings, dependent variables, independent variables, and baseline data. Single-case researchers must also engage in and document experimental control/internal validity, external validity, and social validity (Horner et al., 2005). Two studies (LeBel et al., 2013; Sanetti et al., 2016) met all quality indicators while one study (Chafouleas et al., 2007) met all but one quality indicator for single-case research design. A detailed summary of quality indicators met for single-case research studies identified in this review is included in Table 4.

Group design research quality indicators. For the eight studies with group research designs, we used two categories of quality indicators (i.e., essential and desirable). Included in essential quality indicators is the clear description of participants, the implementation of the intervention and description of comparison conditions, outcome measures, and data analysis. Desirable Quality Indicators include the reporting of attrition rates among intervention samples, conducting internal consistency reliability, test-retest reliability, and interrater reliability, addressing outcomes for intervention effects, presenting evidence of criterion-related and construct validity, assessing fidelity implementation, documenting the nature of instruction, including audio or video recording that captures the nature of the intervention, and presenting results in a clear, coherent fashion (Gersten et al., 2005). Seven group design studies identified in this review met the standards to be considered high quality group design studies (Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; Murray et al., 2008; Owens et al., 2012; Vujnovic et al., 2013; Watabe et al., 2013). A detailed summary of quality indicators met for group research studies identified in this review is included in Table 5.

Table 4
Quality Indicators in Single-case Research Design Studies

Studies	Participants/Setting	Dependent Variable	Independent Variable	Baseline Procedures	Experimental Control/Internal Validity	External Validity	Social Validity
Chafouleas et al., (2007)	Yes	Yes	Yes	Yes	Yes	Yes	No
LeBel et al., (2013)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sanetti et al., (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Participants/Settings = Described sufficiently and selection described; Dependent variable = Described with replicable precision, quantifiable, measurement described with replicable precision, measurement occurred repeatedly, inter-observer data reported; Independent variable = Described with replicable precision, systematically manipulated, procedural fidelity described; Baseline procedures = Repeated measurement and evidence of pattern, described with replicable precision; Experimental validity = Three experimental effects at three points in time control for common threats to internal validity; pattern demonstrates experimental control; External validity = Effects replicated across participants, settings, materials; Social validity = Dependent variable socially important; magnitude of change in DV from intervention is socially important, implementation of IV practical and cost effective, enhanced by implementation of IV over extended time periods, by typical intervention agents, in typical context; Yes = Met quality indicators; No = Did not meet quality indicators

Table 5
Quality Indicators in Group Design Studies

	Studies							
	Fabiano et al., (2009)	Fabiano et al., (2010)	Jurbergs et al., (2010)	Murray et al., (2008)	Owens et al., (2012)	Vujnovic et al., (2013)	Watabe et al., (2013)	Williams et al., (2012)
Essential Quality Indicators								
Participants								
Sufficiently described	Y	Y	Y	Y	Y	Y	Y	Y
Comparable across conditions	Y	Y	Y	Y	Y	Y	Y	Y
Interventionists described	N	N	Y	Y	N	Y	Y	N
Independent Variables								
Described clearly	Y	Y	Y	Y	Y	Y	Y	Y
Description of fidelity of implementation	Y	Y	Y	Y	Y	Y	Y	N
Description of comparison condition	Y	Y	Y	Y	Y	Y	Y	Y
Dependent Variables								
Multiple measures implemented	Y	Y	Y	Y	Y	Y	Y	Y
Outcomes measured at appropriate times	Y	Y	Y	Y	Y	Y	Y	Y
Results								

Data analysis techniques used appropriately	Y	Y	Y	Y	Y	Y	Y	Y
Effect size reported	N	Y	N	Y	Y	N	Y	Y
Desirable quality indicators								
Participants								
Attrition rates documented	N	Y	Y	N	Y	Y	Y	N
Attrition rate (< 30%)	N	Y	Y	N	N	Y	Y	N
Dependent Variables								
Evidence of test-retest reliability, internal consistency reliability, and IRR	Y	Y	N	Y	N	N	N	Y
Adequate inter-observer score	Y	Y	Y	N	N	N	N	Y
Data collectors blind to study conditions and unfamiliar with participants	Y	Y	Y	N	N	Y	N	Y
Outcomes measured beyond immediate posttest	Y	Y	Y	Y	Y	Y	Y	N
Criterion and construct validity provided	Y	Y	Y	Y	Y	Y	Y	Y
Independent Variable								
Fidelity of implementation included	Y	Y	Y	Y	Y	Y	Y	N

Comparison conditions described	Y	Y	Y	Y	Y	Y	Y	Y
Results								
Audio or videotape excerpts included	N	N	N	N	N	N	N	N
Results were clear and coherent	Y	Y	Y	Y	Y	Y	Y	Y
Total Indicators Met	16/21	19/21	18/21	16/21	15/21	17/21	17/21	14/21

Notes. Y = Yes; N = No; If information on attrition was omitted the study received a no response as well as a no response on the following quality indicator of attrition < 30%

Discussion

The purpose of this review was to analyze the body of literature on the effects of DBRCs on academic and social behavior for students considered having disruptive behaviors and students with disabilities in academic settings. We calculated effect sizes to provide information on the effectiveness of DBRC for students considered having disruptive behaviors or students identified as having a disability. DBRCs were developed differently in the identified studies however, based on this review and analysis, three components became apparent: feedback provided to students on their performance, home-school communication, and operationally defining target behaviors. See Figure 2 for an example DBRC that has been adapted from Vannest, Burke, Sauber, Davis, & Davis (2011). Additionally, the authors of the identified articles implemented the DBRC intervention with a variety of academic and social behaviors. Based on the results of the identified studies it can be concluded that DBRC have a small to moderate impact for students with disabilities.

Overall, the efficacy of DBRC interventions in the 11 studies in this review was quite variable with the majority of studies (n = 6) demonstrating small to very small effect sizes. Of the five remaining studies, three had effect sizes that could be characterized as medium to large. Our findings on efficacy are consistent with previous findings in the most recent research. For example, Vannest et al. (2010) found a range of effectiveness in their meta-analyses on DBRC single-case research (*range* = -0.15 – 0.97) with a mean IRD of .61. We believe one of the significant findings of this literature review is variability in development and implementation. Variability in the size of effects and intervention efficacy of the 11 DBRC studies that we reviewed might be related to variability in components of DBRC that investigators used in these studies.

Dear _____here is today's Behavior Report Card. Below you can see what is happening for each expectation during _____ class.
Today we did a "Check-in" with yesterday's signed report card: YES or NO
We also did a "Check-out" with today's report card: YES OR NO

Daily Behavior Report Card				
Student Name:				Date:
Return to: _____ the next morning				
Behavior Rating Scale:				
Class Period:	Target Behavior 1:	Target Behavior 2:	Target Behavior 3:	**Teacher Signature:**
	Rating: 1-6	Rating: 1-6	Rating: 1-6	
			Total Points Earned: /	
Teacher Comments:			Parent Comments:	
I need ____ of _____ points to earn my reward.				

Figure 2. Example of a Daily Behavior Report Card

Study Characteristics

Based on the identified studies, the results show that DBRC have been primarily researched with elementary school students in a general education classroom. The majority of participants were labeled as or diagnosed as having ADHD. Authors of the articles also implemented DBRCs with students with EBD, SLD, MD, and OHI. Seven studies (Fabiano et al., 2010; Lebel et al., 2013; Owens et al., 2012; Sanetti et al., 2016; Vujnovic et al., 2013; Watabe et al., 2013; Williams et al., 2012) examined DBRCs pertaining to a single disability (e.g., ADHD, SLD) category. No studies examined the use of DBRC with students in high school. Without information on high school students it is not possible to generalize results to students in that stage of their academic careers.

Components of DBRCs

Identifying target behavior. Daily behavior report cards must have a clear target behavior or behavior constellation (Vannest et al., 2010). The authors of the research studies that qualified for this review targeted behaviors using a variety of methods in the literature. Due to variability identifying target behaviors it is difficult to say which method of identification is most effective. Using IEP goals to identify target behaviors resulted in an effect size interpretation of moderate effectiveness. It is important to note that only two studies (Fabiano et al., 2009; Vujnovic et al., 2013) used IEPs to identify target behaviors.

Feedback. Identified studies including feedback (Chafouleas et al., 2007; Fabiano et al., 2009; Fabiano et al., 2010; Jurbergs et al., 2010; LeBel et al., 2013; 2010; Murray et al., 2008; Sanetti et al., 2016; Watabe et al., 2013) resulted in variable effectiveness. One suggestion for such variability is the temporal dimension of the feedback provided to student via the DBRC. Based on these results of this review, feedback as a component of DBRC may have a positive effect on student academic and social behavior.

Home-school communication. Vannest, Davis, Davis, and Mason (2010) state that the effects of parent involvement in reinforcement planning, reinforcement implementation, and administration of feedback are important variables effecting student behavior change. The results of this review indicate that home-school communication is an important component of DBRC. Home-school communication combined with home-based contingencies is shown to be effective for increasing children's classroom attentiveness and academic productivity (Kelley, 1990). Further, home-school communication allows parent to provide reinforcement outside of the school setting and promotes connection and shared responsibility between parents, teachers, and students (Jurbergs, Palcic, & Kelley, 2007). Studies that included home-school communication resulted in an effect size interpretation of medium to high effectiveness as compared to studies that did not include home-school communication resulting in a weak effect size.

Quality of Research Studies

Single-case quality indicators are used to judge the quality of single-case research (Horner et al., 2005). Using the single-case research quality indicators presented by Horner et al. (2005), two of the three single-case research studies (Lebel et al., 2013; Sanetti et al., 2016) identified for this review met all quality indicators with Chafouleas et al. (2007) meeting all but one indicator. Chafouleas et al., 2007 did not assess for social validity in their study on DBRCs. It is important to

assess for social validity to ensure the behaviors we are identifying for intervention have high social importance, can be implemented by typical intervention agents, and that procedures are acceptable, feasible, effective, and will be used after supports are removed (Horner et al., 2005).

Gersten et al. (2005) suggested eight quality indicators for group design research studies with four described as "essential indicators" and four described as "desirable indicators." In order to be considered acceptable quality, a research proposal or study would need to meet all but one of the "essential indicators" and demonstrate at least one of the "desirable indicators". To be considered high quality a proposal or study would need to meet all but one of the "essential indicators" and demonstrate at least four of the "desirable indicators" (Gersten et al., 2005). Six of the eight group design studies identified for review met the required number of quality indicators to be considered high quality group design studies (Fabiano et al., 2010; Jurbergs et al., 2010; Murray et al., 2008; Owens et al., 2012; Vujnovic et al., 2013; Watabe et al., 2013). Two studies met the required number of quality indicators to be considered an acceptable quality research design (Fabiano et al., 2009; Williams et al., 2012). This is due to a lack of participant and implementation fidelity description in the essential indicators, no effect size reported, a lack of reporting of attrition rates in the study, no information on fidelity implementation, and/or no audio or video excerpts. It is necessary for researchers to adhere to the quality indicators set forth by Gersten et al., (2005) because the indicators are the standards that we use to determine if an intervention is to be considered evidence-based. Based on the results of the quality indicator analysis it can be said that DBRCs are an evidence-based practice.

Limitations of This Review

In the following paragraph, we address three limitations of our review. The first limitation is the small number of total studies (N = 11) that constituted the database for our analytic review and, in particular, having only three studies that qualified in the category of single-case research designs. With so few studies, we were not positioned to calculate meaningful correlation coefficients that might have provided insights on variables that differentiate between studies with relatively greater and lesser effect sizes. The second limitation of our review is that inter-coder agreement was too low for a number of variables. Particularly, inter-coder agreement on single case and group design articles resulted in 87% agreement. The authors believe this is due to the subjective nature of assessing quality indicators. Our third limitation was that we did not contact authors of the 11 studies to request raw data. Instead, we used the Web Plot Digitizer (Rohtagi, 2015), for purposes of calculating effect sizes.

Weaknesses in the Research Base

In this paragraph, we address four areas of weakness in the most current research. First, there was high variability in the independent variable across studies providing no clear-cut standard for developing DBRCs. Second, the high variability in the dependent variables makes it challenging to differentiate student characteristics DBRCs have the greatest positive impact on. Third, two studies (Owens et al., 2012; Vujnovic et al., 2013) examined teacher and parent adherence to DBRC intervention and their perceived benefit on their students' performance. Although adherence to DBRCs is necessary

to show the effectiveness of DBRCs, direct student behavior was not examined in this research and results were highly dependent on indirect measures (e.g., interviews). Finally, only one article addressed students with emotional and behavioral disorder (Fabiano et al., 2009) and in this study EBD was one of four disabilities of interest. No studies examined the effectiveness DBRCs with students with EBD. With an estimated 3% to 6% of school age children having EBD (Kauffman & Landrum 2012) we see a comprehensive examination of the effectiveness of DBRC with this population is missing in this research base. Finally, given the range of effectiveness (i.e., small to large) future investigations should examine what populations DBRCs are most effective and if pairing DBRCs with other strategies (e.g., self-monitoring, goal setting) might increase their effectiveness.

Implications for Practice

In general, research demonstrates DBRCs as an efficient and effective method of intervening with problematic student behavior (Atkeson & Forehand, 1979; Barth, 1979; Chafouleas et al., 2002; Smith et al., 1983). However, the implementation of DBRC is shown to be highly variable in this review. Based on the results of this review:

1. Behaviors used to create scales on a DBRC should be operationally defined.
2. Including home-school communication is a critical component of DBRC and must be included in the implementation if DBRC interventions.
3. Immediate performance feedback should be provided to students on the progress towards behavior goals on a DBRC.
4. Teachers and parents must implement daily behavior reports cards with fidelity in order for the intervention to be successful.

Implications for Research

Future research should continue to examine the effects DBRCs have with students with disabilities academic and social behaviors. An exploration of barriers to implementing DBRCs with fidelity should be conducted in order for DBRCs to be more effective for students with disabilities in academic classrooms. Reducing variability on how behaviors are defined could improve the validity and believability of findings. Additionally, only five group design articles reported an effect size. According to the American Psychological Association researchers are required to report effect sizes. Future research on DBRCs must report effect sizes.

A component that is crucial for the success of a DBRC intervention program is home-school communication. Future research should continue to look at teacher and parent adherence to the DBRC protocol to ensure DBRC programs are being implemented with fidelity, which would allow accurate conclusions to be drawn. There have been a limited number of single-case research design studies completed on DBRC since 2007. Additional single-case research design studies should engage in with-in literature replication were researchers repeat whole experiments with the hope of reproducing original results increasing confidence in those results (Johnston & Pennypacker, 1993).

Next, only one study examined students with EBD (Fabiano et al., 2009) and in this study EBD was one of four disabilities being examined. We see potential for the DBRC intervention to positively impact students with EBD but we are unable to state this definitively due to a lack of research on students with EBD. A deeper

examination of DBRCs with students with EBD is warranted. Finally, only one study examined electronic DBRCs (Williams et al., 2012). We found limited research on the use of electronic DBRCs. Therefore; researchers should conduct additional research using electronic DBRC in order to examine the effectiveness of electronic DBRCs.

National surveys indicate that few teachers report feeling adequately trained to manage student disruptive behavior (National Council on Teacher Quality, 2014; The New Teacher Project, 2013), and elementary school teachers rank classroom management as their second greatest area of need for PD, behind only instructional skills (Coalition for Psychology in Schools and Education, 2006). Implementing a DBRC program can be said to have a small to medium effects on students with disabilities academic and social behavior based on the results of this review. Further investigation must be conducted to examine the efficacy of DBRC interventions for students with a variety of disabilities in various settings, as well as an examination of key components that may increase their efficacy.

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