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SPECIAL SECTION: DIVERSITY AND INCLUSION

# A Descriptive Analysis of Applied Behavior Analysis Research With Economically Disadvantaged Children

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## Abstract

In the United States, approximately 43% of children under age 18 are considered economically disadvantaged. Research suggests that these children are at a greater risk for academic underperformance and dropping out of school than their peers who are not from economically disadvantaged backgrounds. As such, they may need effective educational interventions to improve their academic performance. The purpose of the current article is to describe the degree to which economically disadvantaged children are included in educational research in behavioral journals. Ninety-four studies were analyzed to determine the publication trends between 1968 and 2017. Studies were scored and categorized based on journal; publication year; several demographic characteristics for participants including age, income status, and disability diagnosis; and research designs, interventions, and target behaviors. Results suggest that economically disadvantaged children are increasingly included in behavior-analytic literature. However, there are opportunities for research with English language learners and children with disabilities. Implications for practice and research are discussed.

**Keywords** Economically disadvantaged · Low socioeconomic status · Children · Education · Schools

In the United States, *economically disadvantaged* students are students whose family incomes are near the federal poverty level and, as such, qualify for federal assistance programs such as free or reduced-price lunch in school (Department of Health and Human Services, 2019). Based on this definition, approximately 50% of children in public schools attend schools where the majority of students are economically disadvantaged (U.S. Department of Education, 2018). These students are largely younger students, as children under age 12 are more likely to be from economically disadvantaged families than older children are (Jiang, Granja, & Koball, 2017). Additionally, an average of 63% of Black, Hispanic, and Native American children are economically disadvantaged when compared to an average of 30% of Asian and White children (Jiang et al., 2017). Relatedly, Black, Hispanic, and Native American students are three times more likely than White or Asian students to attend mid-poverty or high-poverty schools, which are schools where 50% or more students are economically disadvantaged (U.S. Department of Education, 2018).

Economically disadvantaged children are also more likely to underperform academically than children who are not economically disadvantaged (Wagmiller & Adelman, 2009). Between 1998 and 2017, an average of 17% of economically disadvantaged fourth-grade students read proficiently on the National Assessment of Educational Progress (NAEP) compared to 45% of fourth-grade students who were not economically disadvantaged (U.S. Department of Education, 2019). Similarly, between 1996 and 2017, an average of 29% of economically disadvantaged fourth-grade students had proficient math performance on the NAEP compared to 57% of fourth graders who were not economically disadvantaged (U.S. Department of Education, 2019). The academic progress of economically disadvantaged children is important because research suggests that only 22% of children from economically disadvantaged families graduate from high school, and this number decreases if they cannot read proficiently by third grade (Hernandez, 2012). Because dropping out of high

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school results in a greater risk of unemployment in adulthood (Levin & Rouse, 2012), the failure to graduate can sustain a cycle of economic disadvantage.

Given the relationship between academic performance in school and subsequent postschool outcomes, it is important to determine the degree to which applied behavior analysis has included economically disadvantaged children or organizations (e.g., schools or centers in economically disadvantaged communities) in educational research. *Educational research* is research that is implemented with children from early childhood through secondary school (e.g., birth to age 18) in public or private educational settings and that seeks to improve academic or social behavior. To date, analyses of school-based educational research have been conducted for studies published in the *Journal of Applied Behavior Analysis* (Sulzer-Azaroff & Gillatt, 1990), for children with autism (e.g., Machalicek, O'Reilly, Beretvas, Sigafoos, & Lancioni, 2007), for children with emotional-behavioral impairments (e.g., Hodge, Riccomini, Buford, & Herbst, 2006), and for young children with challenging behaviors (e.g., Conroy, Dunlap, Clarke, & Alter, 2005). However, to the authors' knowledge, no descriptive analysis of the inclusion of economically disadvantaged children in educational research has been conducted for applied behavior analysis journals.

Because the degree to which economically disadvantaged children have been included in behavior analysis is unknown, the purpose of the current article is to describe their inclusion by (a) selecting empirical studies published in behavioral journals between 1968 and 2017 that included educational interventions, (b) describing the inclusion of economically disadvantaged children as participants, and (c) discussing potential research and practice opportunities for behavior analysts who are interested in working with economically disadvantaged children. The article begins with a descriptive assessment of applied behavior analysis research studies that were conducted with economically disadvantaged children, followed by a discussion of implications for researchers and practitioners.

## Method

Three electronic databases were used to identify studies for inclusion in this analysis: PsycINFO, ERIC, and Academic OneFile. The following keywords and Boolean terms were also entered into each of three electronic databases: "low-income" OR "low-socioeconomic status" OR "poverty" OR "free and reduced lunch" OR "Title I" OR "at-risk" (not economically at risk) OR "disadvantaged" OR "deprived" OR "impoverished" OR "welfare" OR "negroes" (used to identify older papers) AND "single-subject design" AND "children" OR "adolescents" OR "teenagers" OR "students" OR "schools" OR "youth." Additionally, with the exception of the term *single-subject design*, the previous keywords and Boolean terms were used to search each of the following journals individually in a university library database: the *Journal of Applied Behavior Analysis* (*JABA*), *Behavior Analysis in Practice*, *The Analysis of Verbal Behavior* (*TAVB*), *The Behavior Analyst* (*TBA*), the *Journal of the Experimental Analysis of Behavior* (*JEAB*), *The Psychological Record*, the *Journal of Behavioral Education* (*JBE*), *Perspectives on Behavior Science*, *Behavior and Social Issues* (*BSS*), and *Behavior Interventions* (*BI*). These journals were selected for individual analysis because they were identified as behavioral journals by the Association for Behavior Analysis International. After studies were returned, each author reviewed the abstracts or bodies of the studies to determine if the inclusion criteria were met.

### Inclusion and Exclusion Criteria

Studies were included in this analysis if they (a) were published between 1968 and 2017, (b) measured or manipulated a variable related to academic or social performance, (c) included a participant who was age 18 or younger or included a participant who was in an extended special education school program (e.g., a student with a developmental disability who was in school until age 21), (d) were conducted in a school or educational center such as an after-school community setting, and (e) included a keyword that indicated that a participant or setting was economically disadvantaged (e.g., a study described its participants or a school setting as being low income or eligible for free and reduced-price lunch). Studies were excluded if they (a) included adults without children as the primary participants (e.g., teaching assistants or paraprofessionals), (b) did not specify that one or more participants or settings were economically disadvantaged, or (c) were conceptual or theoretical.

### Measures and Scoring

Selected studies were analyzed and then categorized on a spreadsheet using the following categories: journal name, age of participants, number of participants, locale of the study (a U.S. Census term that specifies if a geographic area is urban, rural, or suburban), English language learner (ELL) status, disability diagnosis, terms used to indicate income status (e.g., low income, low socioeconomic status, disadvantaged), participant type (child, child and parent, child and teacher), research design, intervention, and target behavior. One person analyzed each article and recorded information for each of the measures on a drop-down box in a spreadsheet. When an author was unsure of a research design or income classification, a second author analyzed the article. Only journals that published studies with economically disadvantaged children were included in the results. Journals that did not report

research with economically disadvantaged children (e.g., *TBA*) were not included in the results although they were analyzed (e.g., they were excluded from the mean).

### Interobserver Agreement

The authors independently scored 15 of 94 (16%) total studies, according to the following categories: age of participants, number of participants, setting and locale of the study, ELL status, disability diagnosis, terms used to indicate income status, participant type, research design, target behavior, and intervention. Studies were randomly selected and assigned to each author. Interobserver agreement across all coding variables averaged 94% (range 80%–100%).

## Results

The initial search returned a total of 1,930 studies. After excluding duplicates and those studies that did not meet the inclusion criteria, 94 articles met the inclusion criteria and were included in this analysis. Results are described as a percentage of the total articles reviewed but may not equal 100% because of rounding.

### Publication Years

Figure 1 illustrates the number of articles published in behavioral journals from 1968 to 2017. In general, economically disadvantaged children have been increasingly included in behavior analysis research since 1968 but to varying degrees over time. For instance, 28% of articles that included economically disadvantaged children were published between 1968 and 1977. However, from 1978 to 2001, only 20% of all articles that included economically disadvantaged children were published. In fact, between 1978 and 2001, there were 14 nonconsecutive years during which economically disadvantaged children were not identified in any research articles. After 2001, economically disadvantaged children were included more often as research participants: 50% of all articles that included economically disadvantaged children were published between 2002 and 2017.

### Journals

*JABA* has published more than half (52%) of all studies that describe economically disadvantaged children. *JBE* has published roughly more than one quarter (28%) of behavior analysis research that included economically disadvantaged children. Interestingly, *JABA* and *JBE* each published most of their journal articles during 10-year spans: *JABA* from 1968 to 1977 and *JBE* from 2006 to 2017. *JEAB* and *BI* published 6% of all studies. *TAVB* and the *Journal of Early and Intensive Behavior Interventions* published 2% of all studies. Twelve percent of studies were published in special education or psychology journals identified in ERIC or other databases.

### Participant Types and Ages

Table 1 lists participant types and ages. Generally, economically disadvantaged children without parents or teachers were the most common participants in research articles. Specifically, elementary school children, ages 6 to 10 years, were the most frequent research participants. However, there have been periods when children from other groups were included more often than elementary school children. For example, children from birth to age 5 were the most highly researched population from 1968 to 1972 but were included

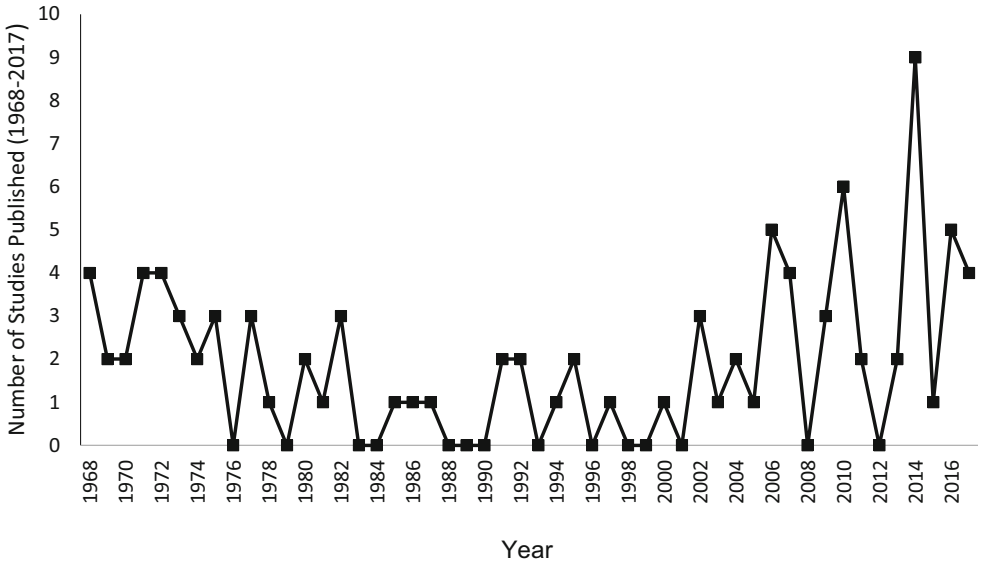


**Fig. 1** Number of educational studies with economically disadvantaged children by year

**Table 1** Participant types, age, disability status, and English Language Learners (ELLs) status[a]

| | | Number of Studies (Percentage) |
|---|---|---|
| Participant Types | Child | 81 (86%) |
| | Child and parent | 1 (1%) |
| | Child and teacher | 12 (13%) |
| | Child and other | 0 |
| | Total | 94 |
| Age Range | Birth–5 | 34 (36%) |
| | 6–10 | 45 (48%) |
| | 11–18 | 15 (16%) |
| | 18+ | 0 |
| | Total | 94 |
| | No disability | 78 (83%) |
| Disability Status | Cognitive | 6 (6%) |
| | Learning | 5 (5%) |
| | Developmental | 3 (3%) |
| | Behavior | 1 (1%) |
| | Other | 1 (1%) |
| | Total | 94 |
| English Language Learners | Yes | 9 (10%) |
| | No | 68 (72%) |
| | Not specific | 17 (18%) |
| | Total | 94 |

[a] Percentages may not total to 100 because of rounding.

less often after 1972 when compared to elementary school children. In contrast, 11- to 18-year-old children have not been included as often as younger children, representing less than 20% of all publications between 1968 and 2017. No students over age 18 were included in any research articles (e.g., older special education students).

## Disability Status and ELLs

Table 1 lists disability diagnosis and ELL status for participants. Approximately 80% of the studies did not include economically disadvantaged children with disabilities as participants. Cognitive, learning, and developmental disabilities comprised the small percentage of studies that reported disability status. One study did not specify disability status for its participants but reported that 32% of participants were generally students with disabilities (Teerlink, Caldarella, Anderson, Richardson, & Guzman, 2017). Similarly, only a small percentage of studies conducted research with economically disadvantaged ELLs. When studies included ELLs in their population, they typically did not specify if the participants were economically disadvantaged. That is, when ELLs were included in studies, researchers did not describe their income status.

## Income Status, Setting, and Locale

Table 2 lists income status, setting, and locale. Between 1968 and 2001, participant income status was primarily described as low socioeconomic status or low income instead of disadvantaged or impoverished. However, after 2001, the term *free and reduced-price lunch* was used more often in research to describe income status. The settings that were used most frequently were K–12 schools followed by preschool settings. Fewer than 3% of all studies were conducted in clinics, day cares, or community settings. The most frequent locales for research were urban locales followed by rural locales. However, in most cases, the locale for a study was not specified.

## Research Designs and Sample Sizes

Table 3 lists research designs and sample sizes. The majority of studies used reversal and withdrawal designs or multiple-baseline across-participants designs. Reversal and withdrawal designs were used most often before 1978 and less often in subsequent years. Alternating-treatments designs, multiple-probe designs, and group designs were implemented far less frequently across all publications. In terms of sample sizes, most studies had sample sizes of more than 10 children, which may have been because some researchers were providing

**Table 2** Income status, setting, and locale[a]

| | | Number of Studies (Percentage) |
|---|---|---|
| Income Status | Low socioeconomic status | 26 (28%) |
| | Low income | 23 (24%) |
| | Free or reduced lunch | 17 (18%) |
| | Disadvantaged | 7 (7%) |
| | Poverty | 7 (7%) |
| | Deprived | 6 (6%) |
| | Lower middle/lower class | 3 (3%) |
| | Impoverished | 1 (1%) |
| | At risk | 1 (1%) |
| | Other (e.g., Head Start) | 3 (2%) |
| Setting | Total | 94 |
| | Center | 6 (6%) |
| | Preschool | 24 (26%) |
| | K–12 School | 61 (65%) |
| | Community center | 1 (1%) |
| | Day care | 1 (1%) |
| | Clinic | 1 (1%) |
| | Total | 94 |
| Locale | Urban | 32 (34%) |
| | Rural | 14 (15%) |
| | Suburban | 7 (7%) |
| | Not specified | 41 (44%) |
| | Total | 94 |

[a] Percentages may not total to 100 because of rounding.

classwide interventions. The majority of large sample sizes were studied between 2000 and 2014, whereas smaller sample sizes (e.g., one to nine participants) were studied consistently between 1968 and 2017. Interestingly, few studies specified which percentage of their sample was economically disadvantaged. For example, a study that had 10 participants may have specified that the study took place in an economically disadvantaged school but may not have specified how many of its participants were economically disadvantaged.

## Target Behaviors, Interventions, and Outcomes

Table 3 lists the target behaviors and interventions. The majority of the studies examined academic reading performance more than disruptive behavior, individual social skills, language, or math. Token economy procedures were the most frequently implemented interventions, followed by self-management, group contingencies, performance feedback, and differential reinforcement interventions. Twenty-two percent of studies targeted more than one behavior, and 16% of studies implemented more than one type of intervention.

Generally, most articles reported successful outcomes for research studies that included economically disadvantaged children. For the current paper, all studies were divided into four categories to analyze their outcomes: (a) academic subjects (writing, spelling, reading, and math), (b) social behaviors (classroom management, disruptive behaviors, and social skills), (c) nonacademic subjects (physical education and safety), and (d) speech and language.

**Writing and spelling** Studies that targeted writing and spelling largely reported positive treatment effects with most participants. Results of these studies demonstrated that writing accuracy and completion increased with contingent reinforcement and feedback for increased numbers of words written (Hansen & Wills, 2014; Miller & Schneider, 1970; Van Houten, Hill, & Parsons, 1975; Van Houten, Morrison, Jarvis, & McDonald, 1974). Additionally, interventions such as classwide peer tutoring, competitive team peer tutoring, self-correction, and a combination of constructed responses with traditional teacher instruction increased spelling accuracy (Greenwood, Terry, Arreaga-Mayer, & Finney, 1992; Lee-Vieira, Mayer, & Cameron, 2006; Madrid, Canas, & Ortega-Medina, 2007; McNeish, Heron, & Okyere, 1992).

**Math** Studies that targeted math responses also reported positive treatment effects for most participants. Effective interventions included goal setting, self-monitoring, and self-reinforcement for completion of math problems (Stevenson & Fantuzzo, 1986); student-teacher conferences combined

**Table 3** Research designs, sample sizes, target behaviors, and interventions[a]

| | | Number of Studies (Percentage) |
|---|---|---|
| Research Designs | Reversal designs | 28 (30%) |
| | Multiple-baseline designs | 20 (21%) |
| | Withdrawal designs | 11 (12%) |
| | Alternating treatment Designs | 10 (11%) |
| | Group designs | 8 (9%) |
| | Multielement designs | 5 (5%) |
| | Other | 12 (13%) |
| | Total | 94 |
| Sample Sizes | 1–5 | 33 (35%) |
| | 6–10 | 18 (19%) |
| | 10+ | 43 (46%) |
| | Total | 94 |
| Target Behaviors | Reading | 25 (27%) |
| | Disruptive behavior | 20 (21%) |
| | Individual social skills | 13 (14%) |
| | Language | 12 (13%) |
| | Math | 9 (10%) |
| | Academic other (e.g., science) | 9 (19%) |
| | Nonacademic (e.g., fire drill) | 4 (2%) |
| | Classroom management | 2 (2%) |
| | Total | 94 |
| Interventions | Token economy | 9 (10%) |
| | Self-management | 7 (7%) |
| | Group contingency | 6 (6%) |
| | Performance feedback | 6 (6%) |
| | Behavior skills training | 5 (5%) |
| | Computer-assisted instruction | 5 (5%) |
| | Differential reinforcement | 5 (5%) |
| | Stimulus discrimination | 5 (5%) |
| | Classwide peer tutoring | 4 (4%) |
| | Peers | 4 (4%) |
| | Teacher attention | 4 (4%) |
| | Verbal behavior | 4 (4%) |
| | Antecedent manipulation | 4 (4%) |
| | Choice | 3 (3%) |
| | Fluency | 3 (3%) |
| | Function-based replacement behaviors | 3 (3%) |
| | Teaching | 3 (3%) |
| | Social attention and reinforcement | 2 (2%) |
| | Social skills | 2 (2%) |
| | Direct instruction | 1 (1%) |
| | Premack principle | 1 (1%) |
| | Prompting | 1 (1%) |
| | Response cards | 1 (1%) |
| | Response cost | 1 (1%) |
| | No intervention | 2 (2%) |
| | Other | 3 (3%) |
| | Total | 94 |

[a] Percentages may not total to 100 because of rounding.

with goal setting and feedback about math problem completion (Rizzo & Belfiore, 2014); peer tutoring and performance feedback (Gilbertson, Witt, Singletary, & VanDerHeyden, 2007); assessment strategies to identify effective instructional strategies for individual students (Kong & Orsco, 2016; Rich & Duhon, 2014); and specific intervention strategies such as cover-copy-compare and math to mastery (Konarski, Johnson, Crowell, & Whitman, 1980; Mong & Mong, 2010).

**Reading** Reading decoding, fluency, and comprehension interventions were effective for participants. Studies of early reading performance with kindergarten ELLs demonstrated that teaching letter names at a slower pace and providing see/say practice opportunities increased letter naming accuracy, fluency, and retention (Gilbertson & Bluck, 2006; Gilbertson, Maxfield, & Hughes, 2007). Training preschoolers to discriminate letters based on critical features instead of noncritical features (e.g., length of line or size of figure) also resulted in greater discrimination of similar letters (Kincaid & Weisberg, 1978; Tawney, 1972). Formal reading programs such as sound partners and corrective reading (Harris, Marchand-Martella, & Martella, 2000; Marchand-Martella et al., 2002), as well as explicit phonics and sight word instruction (Reed, 2013), increased letter sound responses for children in early elementary school and ELLs in middle school.

Effective fluency interventions for middle school and elementary school students included multiple-exemplar instruction, repeated reading, and listening passage preview (Silber & Martens, 2010); reading racetrack fluency drills (Rinaldi, Sells, & McLaughlin, 1997); longer durations of fluency practice (Ross & Begeny, 2010); and performance feedback on incorrectly and correctly read words (Eckert, Dunn, & Ardoin, 2006). Pairing reinforcers with reading increased comprehension for two of four middle school participants (Lahey, McNees, & Brown, 1973). Technology interventions increased fluency and comprehension (Council, Cartledge, Green, Barber, & Gardner, 2016; Gibson, Carledge, & Keys, 2011) but not decoding performance for elementary students (Larabee, Burns, & McComas, 2014) in three studies.

**General academic behavior** Several studies targeted behaviors that were not specific to a particular subject. These studies demonstrated that academic work completion and accuracy increased when token economies, response cards, performance feedback, tangible reinforcement, and social reinforcement were used (Chadwick & Day, 1971; Gardner, Heward, & Grossi, 1994; Kelley & Stokes, 1982; McLaughlin & Malaby, 1972; Saudargas, Madsen, & Scott, 1977). One study also showed gains on IQ tests for preschoolers who were given contingent reinforcement for correct responses (Edlund, 1972), whereas another study demonstrated that preschool participants did not emit untrained equivalence relations following equivalence class training (Pilgrim, Chambers, & Galizio, 1995). Some studies showed that behavioral skills training could establish and maintain safety skills for preschoolers (Dickson & Vargo, 2017; Hanratty, Miltenberger, & Florentino, 2016) and that social skills curricula, a public address system, or group contingencies increased compliance and social skills during physical education classes (Ryan, Ormond, Imwold, & Rotunda, 2002; Sharpe, Brown, & Crider, 1995; Vidoni & Ward, 2006).

**Speech-language** Studies that examined speech and/or language focused on articulation errors, grammatical speech, frequency of speech, complexity of speech, expressive vocabulary, and say-do correspondence. Results suggested that incidental teaching, modeling and reinforcement, and modified antecedents and consequences increased speech and language for general education preschoolers, elementary students, middle school students, and students in special education (Bailey, Timbers, Phillips, & Wolf, 1971; Broden, Copeland, Beasley, & Hall, 1977; Dennis, 2016; Hart & Risley, 1968, 1974, 1975, 1980; Reynolds & Risley, 1968). Two additional studies by McDowell and Caron (2010a, 2010b) used the matching law to predict how adolescent boys would allocate their choices of conversational topics with peers between settings; no interventions were used in these studies.

**Social behaviors** Social behaviors included classroom management, acquisition of social skills, and reducing disruptive behaviors. Most of these studies focused on increasing appropriate social behaviors and compliance while decreasing disruptive behaviors. Results demonstrated that individual, classroom, and schoolwide social behaviors improved for economically disadvantaged students with intervention. For instance, Hanley, Fahmie, and Heal (2014) demonstrated that the Preschool Life Skills curriculum—a formal social skills training curriculum consisting of instruction, modeling, role-play, and differential reinforcement—increased appropriate requests and "self-control" behaviors for Head Start children with disruptive behaviors. These results were replicated in similar studies (Luczynski & Hanley, 2013). Other effective interventions involved increasing reinforcement for children by teaching them to self-reinforce, reinforce their peers, or reinforce their teachers to obtain more verbal approvals (Fantuzzo & Clement, 1981; Polirstok & Greer, 1977; Teerlink et al., 2017). Self-management, group contingencies (e.g., the good behavior game), and contingent reinforcement for rule following were also effective interventions for decreasing disruptive or inappropriate social behaviors while increasing appropriate behaviors (e.g., Balcazar et al., 1991; Hupp & Reitman, 1991; McGoey, Schneider, Rezzetano, Prodan, & Tankersley, 2010). Finally, providing appropriate classroom materials resulted in reducing transitions in preschool classrooms (e.g., Doke & Risley, 1991).

Although most studies reported treatment effects for participants, one study that compared a response cost and levels system noted that it could not determine which treatment was most effective for decreasing disruptive behaviors (Tiano, Fortson, McNeil, & Humphreys, 2005).

## Discussion

The current study was a descriptive assessment of the degree to which economically disadvantaged children were included in educational research in behavior analysis. This is an important issue to examine because national data indicate that school-age children from families with low socioeconomic status perform significantly lower on measures of academic performance than children from higher income families do (U.S. Department of Education, 2018), which places them at risk for dropping out of school and maintaining a low socioeconomic status as adults (Hernandez, 2012; Levin & Rouse, 2012). Because one half of all school-age children in the United States attend schools where the majority of children are economically disadvantaged (U.S. Department of Education, 2018), including them in behavior analysis research could contribute to more positive outcomes for this population of students.

Based on the selected journals included in this analysis, between 1968 and 2017, economically disadvantaged children were included in about 5% of behavior analysis publications to varying degrees during different periods. The majority of children were included during two periods: 1968–1977 and 2002–2017. From 1978 to 2001, the number of studies that included economically disadvantaged children decreased greatly. We suggest that the shift in publications occurred, in part, because of national educational policy and funding opportunities (Association for Professional Behavior Analysts [APBA], 2015). For example, a period of time during which economically disadvantaged children were included most frequently was after the Elementary and Secondary Act (1965) was enacted to providesupplemental funding for schools serving economically disadvantaged students. However, in 1977, after the Education for all Handicapped Children Act (1975) was enacted, children who had developmental disabilities were included more frequently in behavior analysis publications (Northup, Vollmer, & Serrett, 1993). In 2001, the No Child Left Behind Act (2002) , which mandated that schools increase the academic outcomes of economically disadvantaged students, may have influenced the increased number of studies published since 2002.

The current analysis also found that socioeconomic status was not described in most publications, which may have obscured the inclusion of economically disadvantaged children in research. This issue of excluding descriptions of socioeconomic status in research is not specific to behavior analysis. In 2007, the American Psychological Association (APA, 2007) reported similar findings in their report on socioeconomic status in psychology. To address this issue, behavior analysts may need to be intentional about describing the socioeconomic status of participants in research publications.

Because this review was a descriptive assessment of published studies in specific journals and databases, it did not include an analysis of the degree to which educational interventions produced behavior change for economically disadvantaged children (Conroy et al., 2005). However, a descriptive analysis of the results may serve as a useful preliminary assessment of the existing literature (Conroy et al., 2005). Overall, the results of the studies included in this article indicate that educational interventions in behavior analysis improved academic and social outcomes for economically disadvantaged children. Based on this descriptive analysis, behavior analysis has successfully implemented interventions to teach reading, math, and social skills to economically disadvantaged children. This analysis did not compare the effectiveness of behavior analysis to other fields or disciplines serving economically disadvantaged children. However, this may not be an important comparison because the academic performance of economically disadvantaged children is complex and influenced by a number of factors, including nutrition, health, and parenting, among others. Instead, an interdisciplinary approach to interventions in which behavior analysis contributes to a greater effort across several fields (e.g., psychology, social work, medicine) may be necessary to improve their academic outcomes. For example, seminal studies published by behavior analysts like Betty Hart and Todd Risley demonstrated the importance of early childhood interventions for economically disadvantaged children (Hart & Risley, 1995). The work that they conducted in the 1960s and 1970s, and the outcomes of national early childhood projects such as Project Follow Through in the 1970s (Becker & Gersten, 1982), has contributed to more widely used interventions for economically disadvantaged children, such as language interventions and direct instruction programs (e.g., Colker, 2014; U.S. Department of Education, 2007).

This analysis also indicates several areas where behavior analysts may provide support for economically disadvantaged students. Specifically, there are opportunities for research and intervention among adolescents and teenagers, in community centers and rural areas, and with ELLs and children with disabilities. It is noteworthy that the absence of economically disadvantaged children who were ELLs or who had disabilities in this analysis may offer an important opportunity for behavior analysts. Approximately 9.5% of public school students are ELLs (McFarland et al., 2018), which may present an opportunity to provide research-based interventions for ELLs who are economically disadvantaged (National Council on Disability, 2018). Additionally, the low number of studies that included economically disadvantaged students

with disabilities in behavior analysis research may reflect the broader need for special education services in economically disadvantaged communities and schools (National Council on Disability, 2018). Research suggests that families of children with disabilities are at an increased risk for delays in diagnosis and treatment. For instance, Klin, Klaiman, and Jones (2015) noted that although 20% of all children with autism who require special education services are identified before age 3, economically disadvantaged, minority, and rural families are diagnosed approximately 1.5 years later than other children, which causes them to receive later treatment as well.

Although the limited number of articles published during the period of this review may reflect a need for researchers to report the socioeconomic status of their participants more often, the results of this review also suggest a need for more research to be conducted with economically disadvantaged children. One reason why economically disadvantaged children may not be included in research may be because of some of the societal barriers that limit their access to educational and psychological services, including parental employment hours, transportation challenges, and financial barriers (Young & Rabiner, 2015). However, another reason for the exclusion of economically disadvantaged children from research may actually be a lack of behavior analysts who are trained to work with economically disadvantaged populations. According to the APA (2007), despite the number of interventions developed by psychologists, psychology as a field has not adequately addressed the needs of individuals from poor and low-income communities. In behavior analysis, only 13% of certified behavior analysts provide services in education (excluding higher education) compared to 61% who provide services to individuals with autism (APBA, 2015). This barrier can be addressed by expanding the boundaries of competence for future and practicing behavior analysts to include economically disadvantaged populations and collaboration in school-based settings (Behavior Analyst Certification Board, 2014). This training may include, as Liu (2011) suggests in his discussion of social class in the helping professions, educating behavior analysts about the experiences and needs of economically disadvantaged individuals and the intersection between socioeconomic status and other important factors such as disability, race, gender, and aging.

In conclusion, this paper provided a descriptive analysis of the number of educational studies in behavior analysis journals that included economically disadvantaged children as participants. The results of the analysis suggest that economically disadvantaged children are increasingly included in behavior analysis journals when compared to the 1980s and 1990s. The results also suggest that there may be areas of opportunity for research and practice, including working with economically disadvantaged secondary students, students with disabilities, and ELLs and conducting research in community locations and rural areas. One limitation of this analysis is that it only described studies that reported income levels. As a result of our inclusion criteria for studies in this analysis, specifically the criterion that an article must specify a participant's income level, there may have been more published studies that focused on the education of economically disadvantaged children but were not evaluated in this analysis. Another limitation of this analysis is that research from other disciplines that are affiliated with behavior analysis (e.g., special education, social work, and speech-language pathology) may be published in discipline-specific journals, which were also not included in this analysis. Although reviewing discipline-specific journals was beyond the scope of this article, practitioners and researchers who are interested in working with economically disadvantaged children may find it useful to review behavior-analytic research published in other fields such as special or general education.

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## Compliance with Ethical Standards

**Conflict of Interest** Brandi Fontenot, Margaret Uwayo, Sarah Avedano, and Denise Ross declare that they have no conflict of interest.

**Ethical Approval** This article does not contain any studies with human participants performed by any of the authors.

## References

References marked with an asterisk indicate studies included in the literature review

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