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ORIGINAL PAPER

Prevalence of Challenging Behaviors Exhibited by Children with Disabilities: Mapping the Literature

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Abstract

Prevalence studies of challenging behaviors among children with disabilities have a potential value, as they provide information for intervention and evaluation. However, the results from these studies seem to vary according to the population involved, the behaviors explored and the selected methodological procedures and instruments used. The purpose of this study was to identify the prevalence data of challenging behaviors considering the behaviors assessed, how the behavior is measured and which procedures are used to collect the prevalence of these behaviors among school-aged participants with disabilities. We performed a systematic review and selected 20 studies for analysis according to their methodological characteristics. The findings indicated that the most common behaviors studied were aggression and self-injury. Moreover, a wide disparity with respect to procedures and methods (e.g., sampling methods and instruments) to assess the prevalence of challenging behavior was identified. Recommendations for addressing these issues are presented, and implications and suggestions for future research are discussed.

Keywords Challenging behavior · Prevalence · Methodological procedures · Children with disabilities · Systematic review

Introduction

Challenging behavior (CB) has been defined as "culturally abnormal behavior(s) of such intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy or behavior which is likely to seriously limit use of, or result in the person being denied access to, ordinary community facilities"

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(Emerson 2001, p. 3). The presence of these behaviors among children with disabilities has an impact not only on the professionals who support these children and their families (Lecavalier et al. 2006; Ross et al. 2011) but also on their quality of life (Emerson et al. 2014). Some of the most common behaviors among children with disabilities are aggression (i.e., Newman et al. 2015) and stereotypic (i.e., McTiernan et al. 2011) or self-injury behaviors (i.e., Simó-Pinatella et al. 2017), among others. Indeed, the presence of CBs in all educational contexts urgently needs to be addressed (Emerson 2001).

Over the last several decades, a significant amount of research has been conducted to gain a better understanding of the nature of CBs (e.g., Simó-Pinatella et al. 2013) and to improve outcomes and environments for children (e.g., Simonsen et al. 2010). These behaviors have usually been defined in terms of their function and form (Steege and Watson 2009). Studies regarding the function of such behavior have led to the development of intervention plans focused on behavioral needs (e.g., Chung and Cannella-Malone 2010; Lang et al. 2010).

When exploring the prevalence of CBs in children with disabilities, particular emphasis has been placed on the specific type of disability (e.g., Newman et al. 2015) and on the risk factors associated with the occurrence of the behavior (e.g., McTiernan et al. 2011). Prevalence studies can be conducted using indirect methods such as interviews or surveys where a professional of family member is asked to identify if the participant engages in any CB topography. However, this procedure usually relies on only one informant to determine the prevalence of CB. Furthermore, although informants are usually asked to rate a list of different forms of behaviors (e.g., aggressive behavior, hitting others), research highlights the use of different approaches about the amount of time that should be assessed and the definition of a challenging behavior. For example, Simó-Pinatella et al. (2017) have recently explored the prevalence of challenging behavior among children with disabilities by asking informants (e.g., principals and teachers) to complete a questionnaire identifying the prevalence of challenging behaviors. In this questionnaire, professionals were provided with examples and nonexamples of what was understood as a CB. Another approach to identifying the prevalence of CB is direct methods such as direct observation, although those may be more time-consuming for researchers and professionals.

Studies examining the prevalence of CB among children with disabilities are of potential value, as they provide significant information that can be used to determine supports and service planning (Ruddick et al. 2015). So as to create more preventive and sustainable environments in which children can develop to the best of their potential, the exact prevalence of CBs is required to gauge the types, quality, impact and numbers of services needed (Achenbach et al. 2003). This type of data would also be helpful in judging whether a CB in particular locations or settings is higher or lower than expected given its prevalence in similar settings. Prevalence rates may help to determine how behavioral expertise is distributed and which professional development needs should be addressed. Accurate prevalence rates may then have an impact on professional development, intervention selection, resource allocations and other behavioral supports to address the educational and personal needs of children exhibiting CBs.

More specifically, an accurate identification of CBs in school settings may help leadership teams and teachers organize a school's physical spaces and supports, classroom groups and everyday activities in accordance with students' behavioral needs (Simó-Pinatella et al. 2019).

Although the literature suggests that the prevalence of CBs may be more frequent among children with intellectual and/or developmental disabilities than their peers without disabilities (e.g., Emerson et al. 2014), prevalence rates may substantially differ from one study to another. Prevalence rates may also differ depending on the informant; professionals from a specific setting can share different perspectives depending on the behavior-related attributions (Simó-Pinatella et al. 2018). For example, Koritsas and Iacono (2012) studied the prevalence of CBs among children and adults with intellectual disabilities and noted that data collection approaches varied across studies, with some using the existing service registers and others using behavior assessments conducted by interviewers. In one study, Emerson et al. (2005) found significant differences between parents' and teachers' rates when exploring the emotional and behavioral needs of children with intellectual disabilities. Their results pointed to three main possible explanations for these differences including (a) contextual factors associated with the presence of these behaviors, such as routines; (b) differences in informants' perceptions depending on the contextual consequences of the behavior; and (c) the use of different criteria when assessing CB. That is, prevalence rates depend on contextual events that motivate and reinforce behavior occurrences (Steege and Watson 2009) and behavioral attributions (Simó-Pinatella et al. 2018), which may over- or underestimate behavior prevalence (Lowe et al. 2007).

In short, the prevalence identification of CBs engaged in by children with disabilities emerges as a critical issue in providing the necessary supports and services to address and prevent its occurrence. However, and despite the relevance of prevalence studies in determining supports and resources allocation (Ruddick et al. 2015), to date and to the best of our knowledge, not a single study has mapped factors that should be clearly considered when determining and studying prevalence rates. In this sense, the purpose of this study is to conduct a systematic review of studies that have explored the prevalence of CBs exhibited by children and adolescents with disabilities. Specifically, it aims to (a) identify available CB prevalence data, considering the behaviors assessed and (b) identify how these behaviors are measured and which procedures are used to collect and rate the prevalence of these behaviors across studies. By addressing these specific aims, we will be able to discuss if different procedures used when exploring the prevalence of CBs may influence prevalence rates and suggest guidelines for future research. Therefore, this research has the potential to identify the strengths and limitations of the procedures used when exploring the prevalence of CBs among children with disabilities. This body of knowledge may lay the foundation for providing clear guidelines to better identify the prevalence of CBs, thus fostering more reliable knowledge in this area.

Method

Keywords and Inclusion Criteria

A comprehensive review of the literature was conducted using the following electronic databases: Education Resources Information Center (ERIC), PsycInfo, Medline (PubMed) and Web of Science (WoS). The search was conducted using a combination of keywords and key phrases that included “prevalence” or “epidemiology” and “problem behavior” or “challenging behavior,” and spanned the period from 2000 to January 2018. The search for keywords was narrowed to abstracts and/or titles.

To be included in this study, papers had to be (a) peer-reviewed; (b) published between 2000 and 2018; (c) written in English, Spanish or French (note: authors are fluent in these languages); (d) conducted with participants who were children or adolescents with disabilities (participants were school-aged: from 18 to 21 years old); and (e) focused on the prevalence of the following observable CBs among children and adolescents: aggression, self-injury, destructive behavior, disruptive behavior, stereotypy, withdrawn, or noncollaborative behaviors or eating disorders. These behaviors were considered as topographies; thus, if a study focused on a specific form, for example on self-harm (Laye-Gindhu and Schonert-Reichl 2005), the study was included for review.

Accordingly, articles were excluded if focused on the prevalence of CBs only among adults (e.g., Cooper et al. 2009) or some other type of behavior, such as smoking or alcohol use (e.g., Faeh et al. 2006). Articles were also omitted if a distinction was not made between the prevalence of CBs of children and adults (e.g., Emerson et al. 2001). Lastly, articles exploring the most prevalent functions among a sample wholly engaged in CBs were also excluded (i.e., Embregts et al. 2009).

Procedure

The initial search yielded 1282 peer-reviewed articles. After eliminating duplications, the first author separately checked the titles and abstracts of 1072 articles and selected articles that possibly met the inclusion criteria ($n = 163$). The first and second authors separately reviewed the abstracts of these articles and rejected 90 of the potential articles. At that point, manuscripts not detailing the inclusion of children with disabilities in the sample studied were still included. Full-text records were independently examined and coded by the first and second authors based on the inclusion and exclusion criteria, resulting in the selection of 16 articles for this research with an initial agreement of $K = .939$. Disagreements were discussed between the first and second authors until a final consensus, relying on a strong rationale for either including or excluding the article, was reached. Of the 57 excluded articles, four were not full-text records (e.g., Gopal and Ashok 2012); 18 did not include children with disabilities (e.g., Abdel-Fattah et al. 2004); 12 did not focus on the prevalence of CBs (e.g., Eden et al. 2014);

six sampled participants were not of school age (e.g., Bedford et al. 2001); six of the articles were written in languages other than those considered in the inclusion criteria (e.g., Borsa et al. 2011); three included participants of all ages, but failed to report results for the target group of the study (children and adolescents; e.g., Emerson et al. 2001); and eight did not study at least one of the eight CBs of interest for this study (e.g., Pflug and Schneider 2015).

Two strategies were used to identify additional articles that were either overlooked in the initial search or excluded during the initial review process: (a) the reference lists of selected articles were cross-checked and (b) reviews on the prevalence of CBs were analyzed (e.g., Koritsas and Iacono 2012). This process led to a review of 14 papers, of which nine did not focus on the study of the prevalence of CBs (e.g., Chou 2003) and one did not meet the age criterion for participants (i.e., school-age children; e.g., Dionne et al. 2003). Four studies met all of the inclusion criteria, thus resulting in 20 selected articles (identified with a * in the references).

Data Extraction and Interrater Agreement

The information in the included articles was summarized according to two sets of variables. The first set focused on the prevalence of behaviors included in this review (see inclusion criteria section) and the procedures used. Hence, information from the studies selected was classified according to the prevalence of single or multiple behaviors and the prevalence of the total population studied. Variables analyzed included (a) disability, (b) prevalence, (c) relevant participant information (gender and age ranges of participants) and (d) procedural variables (sampling procedures and steps followed to assess the CB, categorized into one or multiple step procedures). If articles identified prevalence rates considering internalizing and externalizing behaviors (i.e., Hartley et al. 2008), prevalence rates of the specific behaviors forms that this review focuses on were gathered, whereas if studies did not unravel the prevalence rates of the specific forms of behavior this study targeted, information was not included. The second set focused on how the behavior was measured by exploring the instruments used. These variables included (a) who the informants were, (b) types and forms of the behaviors that the instrument included, (c) behavior parameters assessed (i.e., frequency, intensity), (d) period of time assessed and (e) limitations. For those articles that separated the data on children from those of adults (e.g., Lowe et al. 2007), the relevant data and information were extracted.

Each reviewer independently located and described the variables of interest, and interrater agreement was established for each variable. Interrater agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements multiplied by 100. Initially, interrater agreement was 96.76%. Disagreements were discussed until consensus was reached.

Results

The results are separated into different sections. Tables 1, 2 and 3 summarize the CBs assessed, sample characteristics, and prevalence rates reported from the 20 selected manuscripts. As this study focused on children with disabilities, and although some of the studies included samples with and without disabilities, the information further reported and presented in Tables 1, 2 and 3 is only on children and adolescents with disabilities. Specifically, prevalence rates, participants' information and methodological procedures of selected studies are presented for single CB types and forms in Table 1, for multiple CB types and forms in Table 2 and for overall CBs in Table 3, as reported in the selected studies.

Prevalence Rates Across Disabilities

Prevalence rates are presented as a function of the type of CB reported. The most analyzed type of CB across studies was aggressive behavior ($n = 11$, e.g., Farmer and Aman 2011), with general prevalence rates ranging from 10% (Ruddick et al. 2015) in a sample of students with ID to 85% (Newman et al. 2015) in a sample of students with Fragile X. The current results suggest that aggressive behavior has been studied in a wide range of disabilities, mainly ($n = 4$) with participants with ID with prevalence rates differing from 10% (Ruddick et al. 2015) to 71.5% (Simó-Pinatella et al. 2017). Participants with autism spectrum disorder (ASD; $n = 2$) were found to have higher prevalence rates, from 22.5% (Hartley et al. 2008) to 56.3% in a sample of students with ASD and ID (McTiernan et al. 2011) as well as in two studies involving participants with genetic syndromes (Down syndrome; van Gameren-Oosterom et al. 2013; and Fragile X syndrome; Newman et al. 2015). Aggression has also been studied in conjunction with other behavior types, as Table 2 depicts in samples of participants with ASD and ID. In conjunction with stereotypy (Murphy et al. 2009), both behaviors reached a prevalence rate of 32% and together with stereotypy and self-injury (McTiernan et al. 2011) the prevalence rate was of 93.7%.

Self-injurious behavior was also studied ($n = 7$; e.g., Ruddick et al. 2015), mainly ($n = 2$) in participants with ID with prevalence rates ranging from 5.3% (Ruddick et al. 2015) to 47.2% (Simó-Pinatella et al. 2017). Notably higher prevalence rates ranging from 58% (Symons et al. 2003) to 80% (Newman et al. 2015) were found in two studies involving participants with Fragile X.

Stereotypy was studied in four articles. Two studies involved participants with ASD and ID and prevalence rates ranged from moderate (27%, Murphy et al. 2009) to high (92%, McTiernan et al. 2011) percentages. It must be noted that in a sample of children with Fragile X syndrome (i.e., Newman et al. 2015), the prevalence rate was 100%.

Disruptive behavior was analyzed in three articles. Prevalence rates ranged from moderate (42% in students with learning disabilities, Lowe et al. 2007) to very high (84.6% in students with ID, Simó-Pinatella et al. 2017). In Richdale et al. (2000), prevalence rates were reported through means and standard deviations.

Table 1 Prevalence rates, participants' information and methodological procedures of single challenging behaviors topographies across studies

Disability	Prevalence rates	Sample		Sampling methods	Setting	Procedures	References
		N (% females)	Age range (M, SD)				
Aggressive behavior							
Learning disabilities	35%	196 (27%)	5–19	Intentional	School	Answer to questionnaire and interviews	Lowe et al. (2007)
Intellectual disability (ID)	62%	100 (43%)	12–18 (M = 14.96, SD = 1.5)	Cluster random sampling	School	Answer to questionnaire	Pavlovic et al. (2013)
	10.8%	943 (37.5%)	5–18 (M = 10.8, SD = 3.8)	Intentional	School	Answer to questionnaire	Ruddick et al. (2015)
	40.7% (CBCL data) and 22.9% (TRF data)	968 (40.4%)	6–18	Stratified multistage random sampling	School	(1) Answer to CBCL and TRF (2) Answer to DBC[4] to confirm CBCL and TRF results	Dekker et al. (2002)
	71.5%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)
Down syndrome	(M = 3.82, SD = 3.76)	322 (47%)	16.8–19.9 (M = 18.3, SD = 0.82)	Intentional	Service providers	Answer to questionnaire	van Gameren-Oosterom et al. (2013)
Fragile X syndrome	85%	47 (25%)	2–17 (M = 7.84; SD = 4.19)	n.p.	n.p.	Answer to questionnaire	Newman et al. (2015)
Autism spectrum disorder (ASD)	22.5%	169 (77.50%)	(M = 3.51; SD = 0.86)	Intentional	Home	Answer to questionnaire	Hartley et al. (2008)
	56%	1380 (13.40%)	4–17 (M = 9.1, SD = 3.5)	Intentional	n.p.	Answer to questionnaire	Kanne and Mazurek (2011)
ASD and ID	56.3%	174 (17.20%)	3–14 (M = 8, SD = 2.38)	n.p.	n.p.	Answer to questionnaire	McTiernan et al. (2011)

Table 1 (continued)

Disability	Prevalence rates	Sample		Sampling methods	Setting	Procedures	References
		N (% females)	Age range (M, SD)				
ASD, attention and hyperactivity disorder and defiant disorder	Means and SD for each item	365 (39.20%)	3–21	Intentional	School	Answer to questionnaire	Farmer and Aman (2011)
Self-injury behavior							
Learning disabilities	17%	196 (27%)	5–19	Intentional	School	Answer to questionnaire and interviews	Lowe et al. (2007)
ID	5.3%	943 (37.5%)	5–18 (M = 10.8, SD = 3.8)	Intentional	School	Answer to questionnaire	Ruddick et al. (2015)
	47.2%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)
ASD	30%	83 (n.p.)	(11.77, 3.59)	Intentional	School	Answer to questionnaire	Akram et al. (2017)
ASD and ID	48.9%	174 (17.20%)	3–14 (M = 8, SD = 2.38)	n.p.	n.p.	Answer to questionnaire	McTiernan et al. (2011)
Fragile X syndrome	58%	55 (0%)	1.6–12 (M = 6.6)	Intentional	Home	Answer to questionnaire	Symons et al. (2003)
	80%	47 (25%)	2–17 (M = 7.84; SD = 4.19)	n.p.	n.p.	Answer to questionnaire	Newman et al. (2015)
Stereotypy							
ID	55.3%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)

Table 1 (continued)

Disability	Prevalence rates	Sample		Sampling methods	Setting	Procedures	References
		N (% females)	Age range (M, SD)				
ASD and ID	92%	174 (17.20%)	3–14 (M = 8, SD = 2.38)	n.p.	n.p.	Answer to questionnaire	McTiernan et al. (2011)
	27%	157 (17.20%)	3–14.2 (M = 8.5; SD = 2.17)	n.p.	n.p.	Answer to questionnaire	Murphy et al. (2009)
Fragile X syndrome	100%	47 (25%)	2–17 (M = 7.84; SD = 4.19)	n.p.	n.p.	Answer to questionnaire	Newman et al. (2015)
Destructive behavior							
Learning disabilities	24%	196 (27%)	5–19	Intentional	School	Answer to questionnaire and interviews	Lowe et al. (2007)
ID	7.3%	943 (37.5%)	5–18 (M = 10.8, SD = 3.8)	Intentional	School	Answer to questionnaire	Ruddick et al. (2015)
Disruptive behavior							
Learning disabilities	42%	196 (27%)	5–19	Intentional	School	Answer to questionnaire and interviews	Lowe et al. (2007)
ID	M = 12.94, SD = 6.92	52 (32.7%)	18–19 (M = 7.7, SD = 4.0)	Intentional	Service providers	Answer to questionnaire	Richdale et al. (2000)
	84.6%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)

Table 1 (continued)

Disability	Prevalence rates	Sample		Sampling methods	Setting	Procedures	References
		N (% females)	Age range (M, SD)				
No collaboration							
ID	64.2%	205 (39%)	6–19	Intentional	School	Two independent informants identify students with CB and teachers of identified students were interviewed	Simó-Pinatella et al. (2017)
Withdrawn							
ID	22.9% (CBCL data) and 14.4% (TRF data)	968 (40.4%)	6–18	Stratified multistage random sampling	School	(1) Answer to CBCL and TRF (2) Answer to DBC[4] to confirm CBCL and TRF results	Dekker et al. (2002)
	43.9%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)
ASD	70.4	169 (77.50%)	(M = 3.51; SD = 0.86)	Intentional	Home	Answer to questionnaire	Hartley et al. (2008)
Down syndrome	M = 3.65, SD = 2.95	322 (47%)	16.8–19.9 (M = 18.3, SD = 0.82)	Intentional	Service providers	Answer to questionnaire	van Gameren-Oosterom et al. (2013)

n.p., not provided

Table 2 Prevalence rates, participants' information and methodological procedures of multiple behaviors identified across studies

CBs	Disability	Prevalence rates (%)	Sample		Sampling methods	Setting	Procedures	References
			N (% females)	Age range (M, SD)				
SIB, stereotypic and aggression	ASD and ID	93.7	174 (17.20%)	3–14 (M = 8, SD = 2.38)	n.p.	n.p.	Answer to questionnaire	McTiernan et al. (2011)
Aggression and stereotypy	ASD and ID	32	157 (17.20%)	3–14.2 (M = 8.5; SD = 2.17)	n.p.	n.p.	Answer to questionnaire	Murphy et al. (2009)
SIB and stereotypy	ASD and ID	11	157 (17.20%)	3–14.2 (M = 8.5; SD = 2.17)	n.p.	n.p.	Answer to questionnaire	Murphy et al. (2009)

n.p., not provided

Table 3 Prevalence rates, participants' information and methodological procedures of overall CBs identified across studies

Disability	Prevalence rates	Sample		Sampling methods	Setting	Procedures	References
		N (% females)	Age range (M, SD)				
ID	52.1%	1629	6–21	Stratified multi-stage random sampling	School	Answer to questionnaire	Dworschak et al. (2016)
	48%	615	5–16	Cluster sampling	School and home	Answer to questionnaire or interview	Emerson et al. (2005)
	60%	205 (39%)	6–19	Intentional	School	Answer to questionnaire and interviews	Simó-Pinatella et al. (2017)
ID and physical impairment	% of each item	92 (n.p.)	(M = 1.84)	Intentional	Home	Answer to questionnaire	Beernink et al. (2007)
Down syndrome	51%	322 (47%)	16.8–19.9 (M = 18.3, SD = 0.82)	Intentional	Service providers	Answer to questionnaire	van Gameren-Oosterom et al.(2013)
ASD	94%	84 (21.40%)	2.4–18.2 (M = 7.85)	Intentional	Service providers	Answer to questionnaire	Jang et al. (2011)
ASD and ID	93.7%	174 (17.20%)	3–14 (M = 8, SD = 2.38)	n.p.	n.p.	Answer to questionnaire	McTiernan et al. (2011)
	82%	157 (17.20%)	3–14.2 (M = 8.5; SD = 2.17)	n.p.	n.p.	Answer to questionnaire	Murphy et al. (2009)
Pervasive developmental disorder	% of each item	487 (17.40%)	3–21 (M = 9.6, SD = 3.8)	Intentional	School	Answer to questionnaire	Lecavalier (2006)

n.p., not provided

Withdrawn behavior was reported in four studies, with prevalence rates ranging from 14.4% in students with ID (Dekker et al. 2002) to 70.4% in students with ASD (Hartley et al. 2008). It must be noted that in a sample of children with Down syndrome (van Gameren-Oosterom et al. 2013), prevalence rates were reported through means and standard deviations.

Destructive behavior was analyzed in two studies, with prevalence rates ranging from 7.3% (Ruddick et al. 2015) in a sample of participants with ID to 24% (Lowe et al. 2007) for participants with learning disabilities. Noncollaboration was analyzed in one study with participants with ID, with a prevalence rate of 64.2% (Simó-Pinatella et al. 2017).

Lastly, some studies ($n=9$) reported overall CBs prevalence, as displayed in Table 3. Among them, three were devoted to participants with ID with high prevalence rates ranging from 48% (Emerson et al. 2005) to 60% (Simó-Pinatella et al. 2017). However, higher CB prevalence scores were reported for participants with ASD (94%, Jang et al. 2011) and with ASD and ID (93.7, McTiernan et al. 2011). It must be noted that in a sample of children with pervasive developmental disorder (Lecavalier 2006), the prevalence rate was reported for every item of the instrument used to assess overall CB.

Prevalence Rates Presentation

Prevalence rates were reported in a variety of ways, including percentages (e.g., Ruddick et al. 2015) and means and standard deviations (e.g., van Gameren-Oosterom et al. 2013). Murphy et al. (2009) studied what they defined as CBs and reported their prevalence by displaying the set of included behaviors (aggression, self-injury and stereotypy). Although in some studies the reporting focus was on one specific type of behavior (e.g., aggression; Farmer and Aman 2011), in other studies the emphasis was on reporting the prevalence of behavioral problems in general (e.g., Emerson et al. 2005). In other studies, the percentage (e.g., Lecavalier 2006) or means and standard deviations (e.g., Farmer and Aman 2011) of each item of the instrument were reported to assess the prevalence of CBs.

Sampling Methods and Setting

The sampling procedures used to collect data from the participants were generally nonprobabilistic ($n=14$; e.g., Symons et al. 2003). Some studies ($n=3$; e.g., Pavlovic et al. 2013) performed cluster or stratified random sampling. The remaining studies ($n=3$; e.g., McTiernan et al. 2011) did not specify their sampling approaches. Data were predominantly collected in schools ($n=10$; e.g., Dworschak et al. 2016), family homes ($n=4$; e.g., Symons et al. 2003) and services providers (e.g., van Gameren-Oosterom et al. 2013). In four studies (e.g., Kanne and Mazurek 2011), this information was not provided.

Assessment Procedures and Limitations

In the majority of the studies ($n=16$; e.g., Newman et al. 2015), a one-step procedure was used to assess the presence of CBs (i.e., administering a questionnaire). In the remaining four articles, a two- or three-step process was used. For example, Lecavalier (2006) performed a cluster analysis to confirm whether the formed groups of behaviors concurred with parents' and teachers' ratings using the Nisonger Child Behavior Rating Form (NCBRF; Aman et al. 1996). A similar approach to assessing CBs was used in two studies (Lowe et al. 2007; Simó-Pinatella et al. 2017). First, they administered a general instrument to the headmaster of the school or the service facility to identify the number of students who exhibited CB. Second, teachers or staff were asked to provide detailed information of the type, frequency and intensity of the targeted behaviors via an interview conducted by one of the researchers (Simó-Pinatella et al. 2017). Additionally, Lowe et al. (2007) repeated the interviews 2 weeks after the first round to assess reliability.

Some limitations have been reported in the above studies. For example, relying solely on one source of information was the primary limitation cited in four studies (i.e., Beernink et al. 2007; Farmer and Aman 2011; Ruddick et al. 2015; van Gameren-Oosterom et al. 2013). Measurement subjectivity based on only a teacher, parent or student response was reported in two studies ($n=2$; i.e., Murphy et al. 2009; Symons et al. 2003), and lack of other measures, such as observations or interviews (Hartley et al. 2008), was indicated as a limitation. In Emerson et al.'s (2005) study, in which data were collected from two informants, the limitation was the low levels of agreement reached between informants. In the remaining studies, use of nonprobabilistic sampling methods ($n=2$; e.g., Pavlovic et al. 2013) and inconsistency in the prevalence percentages due to high nonresponse rates (i.e., Beernink et al. 2007) were reported as limitations. In addition, limitations in the instrument used to assess targeted behaviors ($n=2$; i.e., Dekker et al. 2002; Dworschak et al. 2016) and in the size of the sample used were reported as limitations in two studies (i.e., Akram et al. 2017; Simó-Pinatella et al. 2017). No information regarding limitations related to the prevalence assessment methods and/or procedures was reported in seven studies (e.g., Richdale et al. 2000).

Instruments and Respondents

Studies included in this review used different instruments to assess the prevalence of CBs. In four studies ($n=4$; i.e., Beernink et al. 2007; Dekker et al. 2002; Hartley et al. 2008; van Gameren-Oosterom et al. 2013), CBs were evaluated using one of the following tools within the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach and Rescorla 2001): the Child Behavior Checklist (CBCL; $n=4$) or the Teacher's Report Form (TRF; $n=1$). Also, in four studies (e.g., Emerson et al. 2005) the Developmental Behavior Checklist (DBC; Einfeld, and Tonge 1995) was used. Three studies (e.g., McTiernan et al. 2011; Murphy et al. 2009; Newman et al. 2015) used the BPI (Rojahn et al. 2001), two studies (e.g., Farmer and Aman 2011; Pavlovic et al. 2013) used the Children's Scale for Hostility and

Aggression: Reactive/Proactive (C-SHARP; Farmer and Aman 2009, 2010) and two other studies used adapted versions of the Setting and Individual Interviews (Kiernan and Qureshi 1986; e.g., Simó-Pinatella et al. 2017). Kanne and Mazurek (2011) explored aggressive behavior by asking two general questions about behavior occurrence (form not specified) to caregivers (e.g., family members or other people). In Symons et al.' (2003) study, a survey was purposely created to assess targeted behaviors, and in Beernink et al.' (2007) study, items were combined from the existing scales. Seven different instruments were used at least once in the selected studies to assess CBs. For example, Ruddick et al. (2015) used the Wessex scales (Kushlick et al. 1973). Respondents included parents ($n=14$; e.g., Hartley et al. 2008), students (Pavlovic et al. 2013) and teachers ($n=10$; e.g., Dekker et al. 2002).

CB Typologies and Parameters Assessed

In most of the instruments, frequency ($n=13$; e.g., Dworschak et al. 2016) was the behavioral characteristic most commonly assessed. In addition, in terms of behavior typologies explored with the instruments, sixteen studies used instruments that include different categories of CB with a different number of items (i.e., forms of behavior). On the other hand, two studies used general categories of CB to explore its prevalence (e.g., Akram et al. 2017), and two others explore the prevalence of CB based on specific items (forms). Symons et al. (2003) used 7 forms of SIB to explore its prevalence and Kanne and Mazurek (2011) studied the prevalence of CB using two items from the ADI-R. Lastly, determining a behavior as problematic may depend on the period of time assessed. For instance, McTiernan et al. (2011) asked respondents to consider the last 2 months of behavior occurrence, whereas in other studies the range time was not specified (e.g., Akram et al. 2017). In only two studies was agreement calculated among respondents, either by conducting specific statistical analysis to test differences in responses among informants (i.e., McNemar test; Ruddick et al. 2015) or by analyzing the Kappa coefficient (Emerson et al. 2005).

Discussion

The present study intended to systematically review studies that have explored the prevalence of CBs exhibited by children with disabilities and the procedures used to rate the prevalence of these behaviors. Specifically, we aimed to summarize data available about behaviors assessed and those procedures used to collect these data. Based on the results, for those studies that provided overall prevalence rates, there was consistency from one study to another. In studies involving children with ID, overall prevalence rates ranged from 48% (Emerson et al. 2005) to 60% (Simó-Pinatella et al. 2017), and for those exploring it with children with ASD, the prevalence rate was approximately 90% (Jang et al. 2011). These results also illustrate that children with ASD seem to present more CBs than children with ID. However, these differences between children with ID and with ASD are not surprising, given the communicative and social deficits that children with ASD present (McTiernan et al. 2011). Moreover, discrepancies in prevalence rates may not be exempt from the severity of the disability (Healy et al. 2014).

When considering different types of CBs, the most common behaviors assessed were aggression and self-injury. Prevalence rates for these behaviors differed among studies. For example, aggressive behavior ranged from 10% (Ruddick et al. 2015) to 71.5% (Simó-Pinatella et al. 2017) for children with ID and from 22.5% (Hartley et al. 2008) to 56.3% (McTiernan et al. 2011) for children with ASD and ID. Similarly, self-injury behavior ranged from 5.3% (Ruddick et al. 2015) to 47.2% (Simó-Pinatella et al. 2017) for children with ID and from 58% (Symons et al. 2003) to 80% (Newman et al. 2015) for children with Fragile X syndrome. As discussed below, differences in methodological procedures can compromise prevalence rates across studies.

As for methodological procedures, findings highlight the broad diversity of procedures used to explore numerous CBs. A wide range of instruments was also administered to parents, teachers, children or some combination thereof to assess the presence of CBs. The level of precision when assessing CB (types of behavior or specific forms) and those aspects that define whether a behavior is problematic or not (e.g., frequency or intensity) also varied across studies, as well as the temporal range of time wherein the behavior must be assessed. Single-informant responses were reported as a limitation, as the necessary assumptions to reliably qualify the behavior as challenging were not met. However, when information was gathered using more than one informant, agreement among informants was far from being acceptable in some cases, thus underlying the need for a more thorough process of data collection. This diversity in methodological underpinnings may contribute to the variability in prevalence rates (Healy et al. 2014), thereby making comparisons close to impossible. Moreover, the wide range of methodological procedures used to assess CB occurrence stand as major barriers to data analysis and interpretation, determination of prevalence rates, intervention development, and experimental verification and replication (Sturmey and Didden 2014).

The findings presented in this review, though informative, are not exempt from the following limitations. First, the review was restricted to specific behaviors exhibited by children with disabilities. Thus, the inclusion of other behaviors would account for differences in the results of this study. Second, while the inclusion of unpublished papers could provide significant data for the present study, this systematic review was limited to peer-reviewed published studies, as unpublished data are unequally accessible and their accuracy may be difficult to assess (McAuley et al. 2000). Despite these potential limitations, this systematic review provided us with a useful and rigorous summary of published studies within the targeted population involved.

Prevalence rates of specific behaviors differ from one study to another. Data collection procedures (i.e., instruments used, informants, etc.) undoubtedly influence prevalence rates. To reduce ambiguity and increase specificity from a research perspective, methodological procedures must then be carefully and systematically clarified. Several assumptions are thus derived from this study. First, researchers must justify and describe the instruments used to assess the prevalence rates of CBs (Feeney-Kettler et al. 2011; Ketller et al. 2014). From our perspective, the information regarding the behavior assessed should add an observable description and consider frequency, duration, locus (place), intensity, latency and topography (e.g., Cooper et al. 2007). Hence, differences in criteria when assessing CBs would be avoided, thus allowing for a more similar understanding among informants (Simó-Pinatella et al. 2018). For example, one of the indirect measures used in some studies included in this review was the BPI (Rojahn et al. 2001). This instrument focuses primarily on three specific types of behavior (aggressive/destructive, self-injurious and stereotypic) related to individuals with ID and considers the intensity and frequency of those behaviors within detailed definitions. The CBPES-I (Simó-Pinatella et al. 2017) provides examples of when a behavior should be understood as a CB or not.

Second, CBs should be assessed by more than one respondent (e.g., teacher, assistant teacher, psychologist) with direct working experience with students being assessed. The range of time assessed should also be specified (e.g., McTiernan et al. 2011). In addition, multiple assessment procedures (e.g., survey, interview, rating scale) should be used, especially direct observation, which was identified as important but frequently lacking in many studies (e.g., Ruddick et al. 2015), though direct assessments are usually time-consuming (Miltenberg 1998).

Third, further research should strive toward a commonly shared standardized way of report CB prevalence rates, thus facilitating comparisons among studies. At a minimum, prevalence rates must be presented with percentages with respect to specific types of behaviors. Studies must also be compelled to describe, in detail, students' characteristics (e.g., age/grade, with/without disabilities, gender, race), settings (e.g., classroom, school), and respondent (e.g., family, teacher, support staff). Ensuring reliable prevalence estimation procedures necessarily implies standardizing both sampling and assessment methods. The consistency of the collected data becomes crucial to effective and relevant support allocation decision-making processes. For this reason, and as a brief summary of our recommendations, we strongly suggest that researchers specify, justify and operationalize the following elements: (a) criteria for evaluating whether a behavior is problematic, (b) setting of the behavioral occurrence, (c) targeted population, (d) social and cultural variables (e.g., race, gender, socio-economic status, language), (e) thorough description of instruments and justification for their use, (g) interrater agreement procedures, and (h) experience and knowledge of informants with students.

Lastly, from an applied perspective, prevalence studies are important when making fiscal, programmatic, personnel and policy decisions related to the provision of services and support to children and young adults with behavioral needs. The information derived from these studies should help leadership teams to consider how prevalence rates change over time within a given classroom, school or district. In addition, an accurate knowledge of the prevalence of CBs in a specific setting might inform what to provide the specific training and strategies practitioners with to support their students' behavioral needs (i.e., functional assessment; Simó-Pinatella et al. 2019). As the success of any intervention depends on its implementation fidelity, one should provide specific training to practitioners in order for them to effectively deal with CB urges (Sigafoos et al. 2014), for example, by involving teachers and practitioners in the assessment of the prevalence of CBs. In summary, while acknowledging the utility of prevalence rates assessment, greater specificity and precision are required to maximize its effectiveness, efficiency and usefulness, especially in addressing the educational needs of students with disabilities and informing stakeholders at the classroom, school, and district/state levels.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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

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