


Prevalence and Risk Markers of Challenging Behavior Among Children with Disabilities

David Simó-Pinatella¹  · Cristina Mumbardó-Adam¹ ·
Esteban Montenegro-Montenegro² · Alba Cortina³ · Joana Maria Mas¹ ·
Natasha Baqués¹ · Ana Luisa Adam-Alcocer¹

Published online: 19 May 2017
© Springer International Publishing 2017

Abstract Children with disabilities are more likely to engage in some form of challenging behavior. The present study sought to investigate the prevalence of challenging behaviors, such as aggressive/destructive or stereotypic behavior, and identify those personal and contextual risk markers associated with the occurrence of challenging behaviors. A total of 205 children with intellectual disability enrolled in a special education school participated in this study. Fifteen professionals participated in this study and responded to two questionnaires via an interview format. Of the sample, 60% were identified as displaying some form of challenging behavior. Both personal and environmental factors within this school were identified as significant predictors of at least one form of behavior. Findings highlight the need to invest in further research to identify personal and environmental variables that may act as risk markers for challenging behaviors in a specific educational setting to customize the services and supports provided.

Keywords Challenging behavior · Prevalence · Risk markers · Disabilities

Introduction

The term challenging behavior (CB) is 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 which is likely to seriously limit use of, or result in the person being denied access to, ordinary community facilities” (Emerson and Einfeld 2011, p. 4). CBs usually include several types of behaviors, such as stereotypy, self-injury, aggression, destruction, and disruption (McTiernan et al. 2011). These behaviors negatively affect the individual’s full participation in natural settings (Carr et al. 2008; Jeong et al. 2013; Lloyd and Kennedy 2014) as they may encompass physical, developmental, academic, and social consequences (McTiernan et al. 2011).

Over the recent decades, research has provided a large body of literature regarding the nature of CBs among people with intellectual disability (ID; e.g., Lowe et al. 2007; Lundqvist 2013; Poppes et al. 2010). Studies have also tackled the prevalence of CBs among children with ID (e.g., Dekker et al. 2002; Farmer and Aman 2011; Ruddick et al. 2015). These studies have usually focused on a specific behavior, such as aggressive behavior (e.g., Pavlovic et al. 2013) or self-injurious behavior (e.g., Symons et al. 2003), or on a specific disability or disorder, such as autism spectrum disorder (ASD; e.g., Hartley et al. 2008; Jang et al. 2011). Overall, research has found that the prevalence rates of aggressive and self-injurious behaviors range, respectively, from 10.8 and 5.3% (children with ID; Ruddick et al. 2015) to 85 and 80% (participants with fragile X syndrome; Newman et al. 2015). Other studies have reported prevalence ranges from 92% for children with ASD and ID (McTiernan et al. 2011) to 100% (Newman et al. 2015) for stereotypic behavior and prevalence rates of 70% in a sample of children and adolescents with learning disabilities exhibiting disruptive behaviors (Lowe

✉ David Simó-Pinatella
davidsp@blanquerna.url.edu

¹ Ramon Llull University, c/ Císter, 34, 08022 Barcelona, Spain

² Institute for Measurement, Methodology, Analysis & Policy, Texas Tech University, 2500 Broadway, Lubbock, TX 79409, USA

³ AMPANS, Crta. Manresa – Santpedor qm 4.400, 08251, Santpedor, Manresa, Spain

et al. 2007). Moreover, some studies have explored the extent to which some participants display more than one type of behavior (e.g., McTiernan et al. 2011, Murphy et al. 2009). For instance, Murphy et al. (2009) explored the prevalence of aggressive, self-injurious, and stereotyped behaviors in a population of 157 children with ASD and ID. The results from their study reported that 82% of the participants engaged in some type of CB. Specifically, 32% of the participants engaged in the three types of studied behaviors, whereas 18% showed aggression and stereotypic behaviors, 11% exhibited self-injury and stereotypy, and 27% presented stereotypic behavior. The percentage of specific behaviors (item-level) within the different categories of CBs has also been explored (e.g., Farmer and Aman 2011; Lecavalier 2006; Lowe et al. 2007).

Although most of the aforementioned prevalence studies have focused on large populations, the relevance of performing such a study in a particular setting cannot be dismissed. Indeed, these studies become crucial for professionals to understand the nature of the behavior and to plan and provide specific resources and supports (Kanne and Mazurek 2011; Lowe et al. 2007). Thus, the exact prevalence rates of CBs are necessary to create more preventive, positive, and sustainable environments for children and adults with disabilities. Research has also emphasized that specific factors, such as age or gender, are associated with the occurrence of CBs among individuals with ID. Furthermore, certain diagnostic conditions, such as ASD, have been deeply studied (e.g., Jang et al. 2011; Kanne and Mazurek 2011; Murphy et al. 2009). However, current studies offer blurred results regarding the type of variables that may act as risk markers for children with ID as well as the extent to which a certain variable influences the occurrence of a CB. For instance, Lowe et al. (2007) examined which personal characteristics were associated with severe CB in a sample of people from this population. They determined that destructive behavior, noncompliance, and aggressive behavior were significantly related to age, which is consistent with Emerson et al. (2001), who identified that the frequency of CBs tends to be higher for older people. However, other studies do not concur that age is a significant variable in terms of predicting any type of CB (Murphy et al. 2009) or aggressive behavior (Pavlovic et al. 2013). That said, some studies have identified gender as a risk factor with respect to the occurrence of CBs (e.g., van Gameraen-Oosterom et al. 2013), while others have not found this association (e.g., Lowe et al. 2007; Pavlovic et al. 2013). Lowe et al. (2007) have stressed that language development is a significantly dominant risk variable when examining self-injurious behavior. Additionally, Poores et al. (2010) have found that sensory and health problems, specifically, tactile, visual, and psychiatric issues, are significantly more highly correlated with the presence of CBs in a sample of children with profound and multiple ID.

The scattered results regarding variables that predict the presence or absence of a CB emphasize the need to deeply explore and analyze the association between personal factors and CBs among people with ID. Indeed, this body of research has the potential to provide the knowledge necessary to identify those children who are at risk of presenting CBs or more severe forms of behavior (Kanne and Mazurek 2011). Tailoring this knowledge, i.e., rates of prevalence and risk markers associated with the presence of CBs, to a specific educational setting enables practitioners and supports providers as they seek to develop more preventive and educational intervention plans. Consequently, the aims of the present study are (a) to describe the prevalence and the topographies of the CBs exhibited by all students with disabilities in a special education school and (b) to assess whether certain personal variables, such as type of disability, gender, or place of residence, influence the occurrence of certain behaviors, such as aggression, stereotypy, self-injury, disruption, withdrawal, and noncollaboration, in this educational setting.

Method

Participants

All students enrolled in a special education school in Catalonia, Spain, were the focus of this study. This special education school was located in a rural neighborhood and had 205 students with disabilities enrolled, most of whom were male (61%; age range 6 to 19 years of age). Participants were diagnosed of ID ($n = 201$), ASD ($n = 86$), attention deficit and hyperactivity disorder ($n = 37$), language and communication disorders ($n = 115$), brain damage ($n = 54$), genetic syndrome ($n = 34$), mental health problems ($n = 14$), and visual ($n = 31$) and hearing ($n = 16$) impairments, as reported by the school personnel. In all, 15 professionals, ranging in age from 22 to 60 years of age ($M = 36.9$; $SD = 11.6$), participated in this study. Inclusion criteria required that they had known the student who presented any form of CB for at least 6 months.

Procedure

Parental authorization to allow teachers to provide information about the students was obtained for all students enrolled in this school. Two instruments were used to accurately identify those students exhibiting CBs. First, to identify students exhibiting CBs, student demographic information was gathered using the *Challenging Behavior Prevalence in Educational Settings: School Information* (CBPES-S). Two informants independently examined the list of all 205 students and selected those students who presented any type of CB.

Second, teachers of the identified students were asked to describe the students' CBs following the guidelines of the *Challenging Behavior Prevalence in Educational Settings: Individual Information* (CBPES-I). Informants were asked to provide detailed information about the frequency and severity of the different topographies of the CB categories being studied (aggression, stereotypy, self-injury, disruption, noncollaboration, and withdrawal). If there were any disagreements between the two informants, the first author discussed it with both informants to reach a consensus.

Measures

Challenging Behavior Prevalence in Educational Settings: School Information

The principal aim of this instrument is to identify those children who engage in CBs in an educational setting. The CBPES-S instrument was adapted from the *Challenging Behavior Survey: Setting Interview* (Lowe et al. 2002a) and divided into four parts. The first part gathers information about the educational setting, such as school location, resources available for students, and the number of professionals working in this school (e.g., teachers, paraprofessionals). The second part gathers student demographic information, such as gender, age, and grade level as well as total number of students and students with disabilities of any type and those exhibiting CBs. The third part of the instrument focuses on the contextual elements directly related to CB management. Finally, the fourth part defines the targeted CBs with definitions, examples, and counterexamples of the types of behaviors that could be defined as challenging, following Emerson and Einfield (2011). The CBPES-S is administered through an interview between a researcher and the school headmaster, psychologist, or grade leader.

Challenging Behavior Prevalence in Educational Settings: Individual Information

The purpose of this instrument is to gather additional details on the CBs exhibited by the identified students. The CBPES-I was adapted from the following three instruments: the *Challenging Behavior Survey: Individual Interview* (Lowe et al. 2002b), the *Behavior Problem Inventory* (Rojahn et al. 2001), and a Spanish instrument, the *Inventory for Individual Service Planning and Programming* [Inventario para la Planificación de Servicios y Programación Individual] (Montero 1996).

The CBPES-I contains six categories of CBs, namely, self-injury behavior (14 items), stereotypy (24 items), aggression/destruction (11 items), disruption (13 items), withdrawal (10 items), and noncollaboration (7 items). It also gathers data about sleeping and eating problems. For each of the categories, information is collected on the types of behavior presented (e.g., biting others), the frequency of occurrence (using a four-point Likert scale ranging from once a month to every hour), and intensity (three-point Likert scale ranging from

mild to severe). The CBPES-I is administered through an interview between a researcher and two independent informants (preferably teachers).

Data Analyses

For the first aim of the present study, percentages of the categories of CBs were calculated across ages. All behavior topographies for each of the six categories of behaviors (aggression, stereotypy, self-injury, disruption, withdrawal, and noncollaboration) were gathered and percentages were calculated.

For the second study objective, logistic regressions were performed to determine whether a set of independent variables predicted each of the six categories of CBs. First, binary variables were calculated for each dependent variable, i.e., the six categories of behaviors, specifying whether the person presented the assessed behavior. If the student scored for frequency and severity in at least one item of a category, he was considered to present this specific category of behavior, for example, self-biting for self-injury. The independent variables encompassed six types of disabilities—namely, visual, hearing, and motor impairment; ASD; attention deficit and hyperactivity disorder; and language and communication disorder (LCD)—as well as sleeping and eating problems, gender, age, and place of residence (family home or residential facilities). All of the variables were also coded as binary variables, with the exception of age. Six different models were run, one for each dependent variable, and a backward stepwise method utilizing likelihood ratio was used to determine the final variables in the model. The first and last steps of the backward stepwise logistic regression analysis are reported in the results. All of the analyses were performed using SPSS 22.0 version software.

Results

Prevalence

Of those in the sample, 123 participants were identified as exhibiting CBs. Ranging in age from 6 to 19 years of age ($M = 13.23$; $SD = 3.31$), the majority were male (66.66%) and lived in their family homes (65.85%). In terms of their disability diagnoses, most had ID (97.56%). Other prevalent disabilities included LCD (59.35%), ASD (54.47%), and brain damage (25.2%). Some students had attention deficit and hyperactivity disorder (17.88%), visual (12.19%) and hearing impairments (7.31%), genetic syndromes (12.2%), and mental health problems (8.94%). With respect to CBs, Fig. 1 depicts the categories of behaviors exhibited by the students across age ranges. Disruptive behavior (84.6%) was the most prevalent followed by aggression (71.5%),

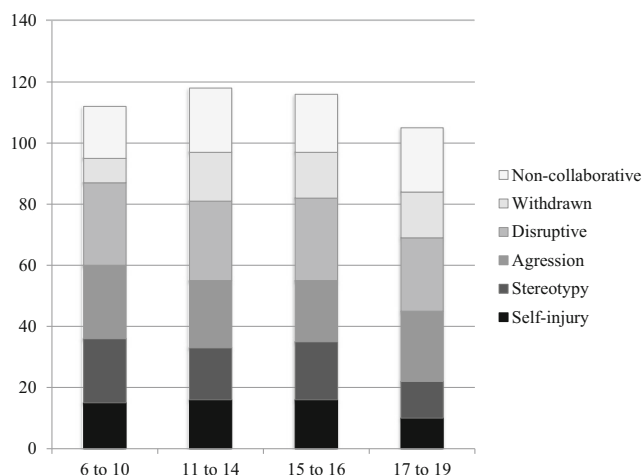


Fig. 1 Prevalence of the eight categories of challenging behaviors distributed by age range

noncollaborative behavior (64.2%), and stereotypy (55.3%). The less frequent behaviors were self-injury (47.2%) and withdrawal (43.9%).

Topographies

The frequency and severity of different topographies of stereotypy and aggression are presented in Table 1. With respect to self-injurious behaviors, hitting their head (13.82% frequency; 11.38% severity), pica (9.76% frequency; 5.69% severity), and self-scratching (8.13% frequency; 7.32% severity) were daily behaviors with moderate severity. Hitting their body also exhibited a high frequency rate (8.13%), but it was slightly less severe (9.77%). Regarding aggressive behaviors, hitting (21.24% frequency; 20.33% severity) and pushing others (21.95% frequency; 20.33% severity) as well as destroying objects (14.63% frequency; 16.26% severity) were weekly occurrences with moderate severity, whereas grabbing and pulling others was a daily occurrence (14.63%) with moderate severity (21.14%).

In terms of stereotyped behavior (Table 2), the students daily but only slightly engaged in pacing (21.14% frequency; 15.45% severity), yelling and screaming (24.39% frequency; 19.51% severity), and repetitive hand gestures (26.02% frequency; 16.26% severity) or body movements (18.70% frequency; 20.33% severity).

With respect to disruptive behavior (Table 3), students daily but only slightly engaged in screaming or making annoying noises (30.89% frequency; 24.39% severity), displayed repetitive or inappropriate verbal behavior (32.52% frequency; 24.39% severity), and were disobedient (27.64% frequency; 21.95% severity). They also daily (34.69%) teased others repeatedly with moderate severity (26.02%).

Regarding withdrawn behavior (Table 4), seeking isolation from others (21.14% frequency; 17.89% severity), sitting or

standing in one position for a long time (21.14% frequency; 17.89% severity), and staring into space (10.57% frequency; 8.13% severity) were daily occurrences with slight severity. Being listless, sluggish, or inactive was also a daily occurrence (16.26%), though it was found to be moderately severe (10.57%). Regarding noncollaborative behavior, students refused to collaborate on a daily basis though it was only slightly severe (31.71% frequency; 24.39% severity), broke the rules (32.52% frequency; 29.27% severity), and acted defiantly (18.70% frequency; 26.02% severity).

Predictors

Table 5 depicts the first and last steps of the backward stepwise logistic regression procedure for the model involving self-injury as the dependent variable and indicates that three of the variables acted as significant predictors. Significant and positive effects for visual impairment, ASD, and LCD indicate that self-injurious behavior is more likely to occur with the presence of these variables. The results also show a large effect of the final variables on self-injury, especially for participants with LCD, who were found to be 6.94 times more likely to display self-injury behaviors.

Regarding stereotyped behavior (Table 6), the variables predicting stereotypy included attention deficit and hyperactivity disorder, ASD, and LCD. Significant effects were positive for ASD and LCD, indicating that this behavior was more likely to occur when those variables were also present. However, the regression coefficient was negative for attention deficit and hyperactivity disorder, indicating that with the presence of this variable, stereotypy is less likely. LCD and ASD variables displayed a large effect in the final model, with the odds of presenting stereotypy in participants with LCD being 9.68 times greater than those for participants without stereotypy. Similarly, participants with ASD were 7.07 times more likely to exhibit stereotypy.

Motor impairment was the sole variable that acted as a predictor of aggressive behavior (Table 7). With the presence of a motor impairment, however, aggression was less likely to occur, as noted by its negative significant effect ($\beta = -1.16$, $p < 0.05$) and small odds (0.314). Thus, participants with motor impairment are 60% less likely to develop aggressive behaviors than their peers without motor impairment.

The model for disruptive behavior (Table 8) indicates that both the place of residence and motor impairment act as significant predictors. In this case, regression significant coefficients were negative, indicating that living in the family home ($\beta = -1.44$, $p < 0.05$) and having a motoric impairment ($\beta = -2.26$, $p < 0.01$) decrease the likelihood of engaging in disruptive behavior. However, participants with visual impairments have 4.96 times greater odds than participants without visual impairment of displaying disruptive behaviors, but the effect is not statistically significant ($\beta = 1.60$, $p > 0.05$).

Table 1 Frequency and severity of topographies of self-injurious and aggressive behaviors

	Frequency (%)			Severity (%)		
	Monthly	Weekly	Daily	Slight	Moderate	Severe
Self-injurious behaviors						
Self-biting	3.25	4.06	7.32	5.69	7.32	1.63
Hitting head	3.25	8.13	13.82	9.76	11.38	4.07
Hitting body	4.07	4.88	8.13	9.77	6.50	8.13
Self-scratching	4.07	2.44	8.13	6.50	7.32	0.81
Vomiting/rumination	2.44	–	1.62	0.81	2.44	0.81
Self-pinching	0.81	0.81	0.81	1.63	0.81	–
Pica	0.81	4.07	9.76	4.88	5.69	4.07
Air swallowing	0.81	0.81	1.62	–	3.25	–
Extreme drinking	–	0.81	1.62	0.81	0.81	0.81
Teeth grinding	–	0.81	4.88	3.25	2.44	–
Aggressive behaviors						
Hitting others	12.2	21.24	9.77	19.51	20.33	3.25
Kicking others	8.13	15.45	9.76	13.82	15.45	4.07
Pushing others	11.38	21.95	8.94	18.33	20.33	1.63
Biting others	8.13	3.25	4.88	3.25	11.38	1.63
Grabbing and pulling	8.13	13.82	14.63	12.20	21.14	3.25
Scratching others	3.25	8.13	4.07	2.44	12.20	0.81
Pinching others	4.88	6.50	5.69	6.50	8.94	0.81
Spitting on others	0.81	4.07	3.25	6.50	1.63	–
Being verbally abusive	5.69	8.94	12.20	16.26	9.76	0.81
Destroying things	11.38	14.63	10.57	13.82	16.26	6.50
Being mean or cruel	3.25	6.50	6.50	8.13	5.69	1.63

With respect to withdrawn behavior, the tested model (Table 9) suggested that two of the variables predicted stereotypy, namely, age and ASD. Significant effects were positive for ASD ($\beta = 0.78, p < 0.05$), suggesting that withdrawn behavior is more likely to occur with the presence of this variable as well as with increasing age ($\beta = 0.13, p < 0.05$). The presence of ASD exhibited the largest effect as the odds of displaying a withdrawal behavior are 2.19 times greater for participants with ASD compared to participants without this diagnosis. That is to say that participants with ASD have 119% greater odds than their peers without ASD to engage in withdrawn behavior.

Finally, the place of residence ($\beta = -1.28, p < 0.01$) and motor impairment ($\beta = -1.84, p < 0.01$) acted as significant negative predictors of noncollaborative behavior (Table 10). As for disruptive behavior, participants living in the family home have 72.1% lower odds of displaying noncollaborative behavior compared to participants living in a fostered residence. The same can be affirmed for participants with motor impairment, where the odds of exhibiting noncollaborative behavior were 84.2% lower for participants with motor impairment versus participants without this diagnosis.

Discussion

The present research sought to examine the prevalence of CBs among children with IDs and to identify the risk markers associated with the occurrence of these behaviors. In agreement with previous research, a high prevalence of CB was found in children

with IDs and some personal and environmental variables were identified as significant risk markers. The results found that 60% of the participants enrolled in the special education school exhibited some type of CB. Consistent with previous research (e.g., Lowe et al. 2007), the most prevalent CB was disruptive behavior (84.6%; $n = 104$) with high rates of prevalence found for aggression, stereotypy, noncollaboration, and self-injury (e.g., Lowe et al. 2007; McTiernan et al. 2011; Newman et al. 2015). In our study, the prevalence rates for these behaviors were 71.5% for aggression, 64.2% for noncollaborative behavior, 55.3% for stereotypic behavior, and 47.2% for self-injurious behavior. Specific findings in the current study were that the most frequent form of self-injurious behavior was “hitting their head” whereas “hitting others” was the most common type of aggressive behavior. With respect to stereotypic behavior, “pacing, yelling, and screaming” was found to be the most frequent form of behavior. “Screaming or making annoying noises” was the most prevalent form of disruptive behavior, and “seeking isolation” was the common type of withdrawn behavior.

With respect to risk markers, the type of disability, i.e., visual and motor impairment, ASD, attention deficit and hyperactivity disorder, and LCD, as well as age and place of residence was found to predict the presence of CBs among children with ID. Regarding the type of disability, five out of the six types explored were identified as significant predictors. First, consistent with previous research, ASD was associated with the occurrence of some behaviors, specifically, self-injurious behavior, stereotypic behavior, and withdrawn behavior. These findings align with the ASD descriptive

Table 2 Frequency and severity of different topographies of stereotyped behaviors

	Frequency (%)			Severity (%)		
	Monthly	Weekly	Daily	Slight	Moderate	Severe
Rocking back and forth	1.63	3.25	18.70	17.07	4.07	2.44
Sniffing objects	–	0.82	2.44	3.25	–	–
Spinning own body	2.44	3.25	4.88	8.94	1.63	–
Waving or shacking arms	1.63	4.07	15.45	12.20	7.32	1.63
Rolling head	0.81	2.44	10.57	8.94	4.07	0.81
Turning around on spot	0.81	4.88	8.94	10.57	4.07	–
Repetitive body movements	–	6.50	18.70	20.33	4.88	0.81
Pacing	0.81	0.81	21.14	15.45	4.88	1.67
Twinning things	–	–	2.44	2.44	–	–
Repetitive hand movements	–	0.81	26.02	16.26	8.13	2.44
Yelling and screaming	–	8.13	24.39	19.51	11.38	1.63
Sniffing own body	–	–	3.25	3.25	–	–
Bouncing around	–	4.07	6.50	8.94	1.63	–
Spinning objects	–	–	4.88	4.07	–	0.81
Bursts of running around	2.44	6.50	10.57	15.45	1.63	2.44
Engaging in complex hand/fingers movement	–	1.63	13.01	9.76	4.88	–
Manipulating objects repeatedly	–	0.81	12.20	10.57	2.44	–
Sustained finger movements	–	0.81	9.76	8.94	1.63	–
Rubbing self	–	0.81	6.50	4.88	1.63	0.81
Gazing at hands or objects	–	4.07	13.01	13.82	3.25	–
Bizarre body postures	–	2.44	8.94	10.57	0.81	–
Clapping hands	0.81	4.07	7.32	11.38	0.81	–
Grimacing	–	3.25	11.38	13.82	0.81	–
Waving hands	0.81	0.81	7.32	6.50	2.44	–

symptoms and characteristics, specifically regarding stereotypic and withdrawn behavior. Furthermore, children with ASD were identified as having a high probability to engage in these behaviors, probably because of major deficits in

coping skills (Matson and Boisjoli 2008). According to other studies, when data regarding the exhibition of CBs in children with ASD are examined, the occurrence of CBs is found to be even more common than first expected (Jang et al. 2011;

Table 3 Frequency and severity of different topographies of disruptive behaviors

	Frequency (%)			Severity (%)		
	Monthly	Weekly	Daily	Slight	Moderate	Severe
Engages in strange behavior	3.25	1.63	18.70	9.76	12.20	1.63
Tease others repeatedly	8.13	9.77	34.96	23.58	26.02	3.25
Screaming or making annoying noises	1.63	7.32	30.89	24.39	14.63	0.81
Immediate or deferred echolalia	0.81	0.81	5.69	5.69	1.63	–
Repetitive/inappropriate verbal behavior	2.44	1.63	32.52	24.39	9.76	2.44
Disobedience	4.88	13.82	27.64	21.95	20.33	4.07
Tantrums	7.32	18.70	13.82	18.70	18.70	2.44
Running away	13.01	8.13	8.94	10.57	12.20	7.32
Stealing intentionally	1.63	4.07	1.63	4.88	2.44	–
Undressing	2.44	0.81	1.63	4.07	0.81	–
Spreading feces on surfaces	1.63	1.63	1.63	1.63	3.25	–
Inappropriate sexual behavior	4.07	5.69	4.07	8.94	4.07	0.81
Inappropriate social initiation	4.07	4.07	7.32	11.38	4.07	–

Table 4 Frequency and severity of topographies of withdrawn and noncollaborative behaviors

	Frequency (%)			Severity (%)		
	Monthly	Weekly	Daily	Slight	Moderate	Severe
Withdrawn behaviors						
Listless, sluggish, inactive	2.44	1.63	16.26	8.94	10.57	0.81
Seeks isolation from others	6.50	2.44	21.14	17.89	12.20	–
Preoccupied, staring into space	4.88	1.63	18.70	13.82	11.38	–
Fixed facial expression, lacking emotional reactivity	–	0.81	7.32	4.07	4.07	–
Resist any form of physical contact	2.44	1.63	4.07	7.32	0.81	–
Sits or stands in one position for a long time	–	2.44	10.57	8.13	4.07	0.81
Unresponsive to daily activities even if encouraged	–	2.44	9.76	6.50	5.69	–
Does not try to communicate by words or gestures	0.81	0.81	4.88	5.69	0.81	–
Shows few social responses	–	1.63	9.76	8.94	1.63	0.81
Self-restraint, hiding, or restraining of hands or arms	–	–	3.25	0.81	1.63	0.81
Noncollaborative behaviors						
Refusal to cooperate	12.20	13.82	31.71	32.52	21.14	4.07
Breaking the rules	7.32	11.38	32.52	29.27	17.89	4.07
Acting defiantly	7.32	13.82	18.70	26.02	11.38	2.44
Absenteeism	2.45	4.88	4.07	8.13	2.44	0.81
Being late to school	0.81	0.81	1.63	1.63	1.63	–
Refusing to wait his turn	3.25	6.50	8.94	13.82	3.25	1.63

Table 5 Logistic regression for prediction of self-injurious behavior

	β	SE	Exp(β)
First step			
Gender	–0.404	0.484	0.668
Age	0.060	0.075	1.062
Residence	–0.645	0.496	0.525
Visual impairment	0.841	0.790	2.319
Hearing impairment	1.500	1.014	4.480
Motor impairment	0.436	0.666	1.547
ASD	1.458	0.520	4.297**
ADHD	–0.041	0.673	0.960
LCD	1.983	0.563	7.263**
Sleep problems	–0.086	0.626	0.918
Eating problems	0.216	0.484	1.241
Constant	–2.637	1.414	0.072
χ^2 (df = 11)	38.123**		
Final step			
Residence	–0.812	0.453	0.444
Visual impairment	1.404	0.687	4.072*
ASD	1.276	0.454	3.581**
LCD	1.937	0.454	6.938**
Constant	–1.698	0.535	0.183**
χ^2 (df = 4)	33.986**		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

Table 6 Logistic regression for prediction of stereotypy

	β	SE	Exp(β)
First step			
Gender	0.173	0.534	1.189
Age	–0.024	0.087	0.976
Residence	–0.509	0.546	0.601
Visual impairment	0.180	0.891	1.197
Hearing impairment	1.351	1.107	3.862
Motor impairment	0.621	0.759	1.862
ASD	2.217	0.606	9.181**
ADHD	–1.767	0.768	0.171*
LCD	2.183	0.591	8.872**
Sleep problems	–0.424	0.744	0.655
Eating problems	0.312	0.571	1.367
Constant	–1.605	1.586	0.201
χ^2 (df = 11)	59.538**		
Final step			
Hearing impairment	1.485	0.963	4.416
ASD	1.956	0.538	7.072**
ADHD	–1.924	0.745	0.146**
LCD	2.270	0.517	9.677**
Constant	–1.875	0.525	0.153
χ^2 (df = 4)	56.610**		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

Table 7 Logistic regression for prediction of aggressive behavior

	β	SE	Exp(β)
First step			
Gender	0.227	0.473	1.255
Age	-0.040	0.075	0.961
Residence	-0.700	0.516	0.497
Visual impairment	-0.160	0.741	0.852
Hearing impairment	0.761	0.997	2.140
Motor impairment	-1.352	0.635	0.259*
ASD	-0.188	0.496	0.828
ADHD	0.061	0.659	1.063
LCD	-0.055	0.554	0.947
Sleep problems	0.488	0.687	1.630
Eating problems	-0.008	0.497	0.992
Constant	2.191	1.465	8.947
χ^2 ($df = 11$)	9.598		
Final step			
Motor impairment	-1.160	0.468	0.314*
Constant	1.240	0.242	3.455**
χ^2 ($df = 1$)	6.034*		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

Matson et al. 2009). Second, LCD was also found to be a significant predictor for self-injurious and stereotypic behavior. Other studies have noted this association between language and communication abilities and the presence of CBs in people with ID (e.g., Lowe et al. 2007). As CBs aim to obtain favorable consequences and/or avoid aversive or unpleasant consequences (Bambara and Knoster 2009; Simó-Pinatella et al. 2013), those who fail to communicate

Table 8 Logistic regression for prediction of disruptive behavior

	β	SE	Exp(β)
First step			
Gender	-0.601	0.668	0.548
Age	-0.113	0.102	0.893
Residence	-1.832	0.797	0.160*
Visual impairment	1.999	1.056	7.378
Hearing impairment	-0.186	1.264	0.830
Motor impairment	-2.294	0.808	0.101**
ASD	-0.716	0.648	2.045
ADHD	1.526	1.178	4.598
LCD	0.377	0.762	1.458
Sleep problems	-0.027	0.924	0.973
Eating problems	-0.037	0.701	0.963
Constant	4.764	2.042	17.261**
χ^2 ($df = 11$)	22.558*		
Final step			
Residence	-1.443	0.722	0.236*
Visual impairment	1.601	0.953	4.956
Motor impairment	-2.256	0.652	0.105**
Constant	3.251	0.713	25.814**
χ^2 ($df = 3$)	16.301**		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

Table 9 Logistic regression for prediction of withdrawal behavior

	β	SE	Exp(β)
First step			
Gender	-0.404	0.441	0.668
Age	0.170	0.073	1.185
Residence	0.197	0.448	1.217*
Visual impairment	1.109	0.768	3.031
Hearing impairment	-0.539	0.890	0.583
Motor impairment	-1.025	0.658	0.359
ASD	0.617	0.444	1.853
ADHD	-0.066	0.580	0.936
LCD	0.831	0.496	2.296
Sleep problems	0.639	0.626	1.895
Eating problems	-0.393	0.465	0.675
Constant	-3.149	1.370	0.043*
χ^2 ($df = 11$)	18.109		
Final step			
Age	0.135	0.059	1.144*
ASD	0.783	0.383	2.187*
Constant	-2.537	0.886	0.079
χ^2 ($df = 2$)	9.641**		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

their own needs or wishes seem more likely to exhibit some form of CB. The results of our study add consistent evidence to this statement as participants with LCD revealed 6.94 and 9.68 times greater odds of displaying self-injury and stereotypic behaviors, respectively. Third, attention deficit and hyperactivity disorder acted as a predictor of stereotypic behavior. Although we did not ask separately if students had principally attention or hyperactivity disorder, or both, a student

Table 10 Logistic regression for prediction of noncollaborative behavior

	β	SE	Exp(β)
First step			
Gender	-0.345	0.479	0.708
Age	-0.007	0.071	0.993
Residence	-1.369	0.533	0.254*
Visual impairment	0.810	0.816	2.247
Hearing impairment	-0.757	0.889	0.469
Motor impairment	-2.567	0.733	0.077**
ASD	-0.745	0.516	0.475
ADHD	0.310	0.625	1.364
LCD	0.360	0.544	1.433
Sleep problems	-0.213	0.619	0.808
Eating problems	-0.216	0.481	0.806
Constant	2.603	1.427	13.504
χ^2 ($df = 11$)	25.077**		
Final step			
Residence	-1.276	0.481	0.279**
Motor impairment	-1.843	0.517	0.158**
Constant	1.845	0.446	6.327**
χ^2 ($df = 2$)	20.917**		

ASD autism spectrum disorder, LCD language and communication disorder, ADHD attention deficit and hyperactivity disorder

* $p < 0.05$; ** $p < 0.01$

who predominantly had hyperactivity disorder may be more subject to constantly engage in behaviors that maintain a high level of activity. Finally, visual and motor impairments acted as significant predictors of self-injury, aggression, and disruptive and noncollaborative behavior, a finding that is consistent with previous studies. Poppes et al. (2010) found that, within a sample of children and adults with profound and multiple disabilities, those with visual impairments received higher mean scores in terms of the occurrence of CBs. A unique finding of this study is that for most types of behaviors, the presence of motor impairment indicates a lower probability to engage in any form of CB. As expected, participants with limited motor abilities are less likely to engage in aggressive or disruptive behaviors, as those require a movement proficiency they may not have.

Considering the other variables explored, neither sleep problems, eating problems, nor gender was identified as predictors for any form of behavior. Similarly, in previous studies, gender was not found to predict the occurrence of self-injurious behavior, aggression, or stereotypic behavior in students with ASD (McTiernan et al. 2011). Age and the place of residence were also identified as predictors for some forms of behavior, which is in contrast with previous research where age did not predict self-injury (e.g., Baghdadli et al. 2003) or aggressive behavior (e.g., Lowe et al. 2007). Past research has identified a relationship between the living environment and the presence of CBs (Poppes et al. 2010). Our findings emphasized that children who lived in residential facilities were more likely to engage in noncollaborative behavior. Thus, because the one-on-one attention becomes almost impossible in a residential facility, it is crucial to organize settings and activities taking into account students' behavioral needs, as meaningful relationships must be established between children and the settings in which they live (Mansell and Beadle-Brown 2012) to provide them with opportunities to reach personal outcomes.

Limitations and Future Research Directions

Though instructive, this study has certain limitations. First, due to the small sample size used in this study and decreased statistical power (Peduzzi et al. 1996), results must be cautiously interpreted. Second, although the primary aim of this study was to study the prevalence and risk markers associated with the presence of CB in a specific educational setting, the specificity of the type of population explored, the definition of CB used, and the assessment instruments employed make comparisons between and among studies difficult (Helay et al. 2014). Finally, limited environmental factors have been collected and analyzed, and teacher-related variables, such as teachers' perceptions of their students' CBs and their expertise and knowledge about CB management, and school organization variables, such as the provision of support materials,

necessarily have an impact on the occurrence of CBs exhibited by students. Future research must tackle this point via an in-depth assessment of all of the contextual variables that may influence the occurrence of CBs in a specific context.

Consistent with this study, further research regarding the prevalence of CBs and the risk markers is needed to expand our knowledge regarding children with ID who exhibit CBs. Risk markers should include personal characteristics, such as age, gender, etc., and environmental variables, such as nature of the task or activity, to anticipate which children are at risk of presenting more severe and more frequent CBs, and under what conditions, contexts, or situations they are more likely to present these behaviors. Previous research (e.g., McGill et al. 2005) has explored the extent to which some environmental variables influence the occurrence of CBs, though no inferential analytic methods have been used in most cases. Therefore, further research is needed to deepen in the identification of specific variables, both personal and environmental (e.g., those explored by the *Contextual Assessment Inventory*; McAtee et al. 2004), that predict CBs through more complex and accurate methods. These procedures may allow researchers to affirm that a specific variable acts as a predictor of CBs in a determined setting. Future studies should identify protective factors, i.e., individual characteristics or environmental variables that may mitigate the risk of developing a CB. Conducting this type of research in specific educational contexts would substantially impact the identification of children who are at risk for developing CBs as well as identifying those environmental characteristics that may cause or give rise to a CB. Because this information is extremely valuable when designing more preventative educational settings, investment in future research will improve our children's outcomes by reducing the possibilities of the occurrence of CBs.

Authors' Contributions DSP and CMA designed and executed the study, assisted with the data analyses, and wrote the paper; EMM analyzed the data and wrote part of the results; AC collaborated with the design of the study and data collection; and JM, NB, and AAA collaborated in the writing and editing of the final manuscript. All authors have contributed to, seen, and approved of the manuscript and agreed to the order of authors as listed on the title page.

Compliance with Ethical Standards

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

References

- Bambara, L. M., & Knoster, T. P. (2009). *Designing positive behavior support plans* (2a ed.). Washington: AAIDD.
- Baghdadli, A., Pascal, C., Grisi, S., & Aussilloux, C. (2003). Risk factors for self-injurious behaviours among 222 young children with

- autistic disorders. *Journal of Intellectual Disability Research*, 47, 622–627.
- Carr, E. G., Ladd, M. V., & Schulte, C. F. (2008). Validation of the contextual assessment Inventory for problem behavior. *Journal of Positive Behavior Interventions*, 10, 91–104.
- Dekker, M. C., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2002). Emotional and behavioral problems in children and adolescents with and without intellectual disability. *Journal of Child Psychology and Psychiatry*, 48, 498–507.
- Emerson, E., & Einfeld, S. L. (2011). *Challenging behaviour* (3rd ed.). Cambridge: University Press.
- Emerson, E., Kiernan, C., Alborz, A., Reeves, D., Mason, H., Swarbrick, R., et al. (2001). The prevalence of challenging behaviors: A Total population study. *Research in Developmental Disabilities*, 22, 77–93.
- Farmer, C. A., & Aman, M. G. (2011). Aggressive behavior in a sample of children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5, 317–323.
- Hartley, S. L., Sikora, D. M., & McCoy, R. (2008). Prevalence and risk factors of maladaptive behaviour in young children with autistic disorder. *Journal of Intellectual Disability Research*, 52, 819–829.
- Helay, O., Lydon, S., & Murray, C. (2014). Aggressive behavior. In P. Sturmey & R. Didden (Eds.), *Evidence-based practice and intellectual disabilities* (pp. 103–132). Chichester: Wiley Blackwell.
- Jang, J., Dixon, D. R., Tarbox, J., & Granpeesheh, D. (2011). Symptom severity and challenging behavior in children with ASD. *Research in Autism Spectrum Disorders*, 5, 1028–1032.
- Jeong, B., Yoo, E., Jung, M., Kang, D., Park, S., & Park, S. H. (2013). Validity and reliability of the Korean version of the behavior problems Inventory. *Journal of Applied Research in Intellectual Disabilities*, 26, 578–590.
- Kanne, S. M., & Mazurek, M. O. (2011). Aggression in children and adolescents with ASD: Prevalence and risk factors. *Journal of Autism and Developmental Disorders*, 41, 926–937.
- Lecavalier, L. (2006). Behavioral and emotional problems in young people with pervasive developmental disorders: Relative prevalence, effects of subject characteristics, and empirical classification. *Journal of Autism and Developmental Disorders*, 36, 1101–1114.
- Lloyd, B. P., & Kennedy, C. H. (2014). Assessment and treatment of challenging behavior for individuals with intellectual disability: A research review. *Journal of Applied Research in Intellectual Disabilities*, 27, 187–199.
- Lowe, K., Allen, D., Jones, E., Brophy, S., Moore, K., & James, W. (2007). Challenging behaviours: Prevalence and topographies. *Journal of Intellectual Disability Research*, 51, 625–636.
- Lowe, K., Brophy, S., Gale, C., Jones, E., Lawrence, B., & Moore, K. (2002a). Special project team. In *Challenging behaviour survey: Setting interview*. Glamorgan: Bro Morgannwg NHS Trust & University of.
- Lowe, K., Brophy, S., Gale, C., Jones, E., Lawrence, B., & Moore, K. (2002b). Special project team. Challenging behaviour survey: Individual Schedule. Bro Morgannwg NHS Trust & University of Glamorgan.
- Lundqvist, L. O. (2013). Prevalence and risk markers of behavior problems among adults with intellectual disabilities: A total population study in Örebro County, Sweden. *Research in Developmental Disabilities*, 34, 1346–1356.
- Mansell, J., & Beadle-Brown, J. (2012). *Active support: Enabling and empowering people with intellectual disabilities*. London: Jessica Kingsley Publishers.
- Matson, J. L., & Boisjoli, J. A. (2008). Strategies for assessing Asperger's syndrome: A critical review of data based methods. *Research in Autism Spectrum Disorders*, 2, 237–248.
- Matson, J. L., Wilkins, J., & Macken, J. (2009). The relationship of challenging behaviors to severity and symptoms of autism spectrum disorders. *Journal of Mental Health Research in Intellectual Disabilities*, 2, 29–44.
- McAtee, M., Carr, E. G., Schulte, C., & Dunlap, G. (2004). A contextual assessment Inventory for problem behavior initial development. *Journal of Positive Behavior Interventions*, 6, 148–165.
- McGill, P., Teer, K., Rye, L., & Hughes, D. (2005). Staff reports of setting events associated with challenging behavior. *Behavior Modification*, 29, 599–615.
- McTiernan, A., Leader, G., Healy, O., & Mannion, A. (2011). Analysis of risk factors and early predictors of challenging behavior for children with autism spectrum disorder. *Research in Autism Spectrum Disorders*, 5, 1215–1222.
- Montero, D. (1996). *Evaluación de la conducta adaptativa en personas con discapacidades. Adaptación y validación del ICAP*. Bilbao: Mensajero.
- Murphy, O., Healy, O., & Leader, G. (2009). Risk factors for challenging behaviors among 157 children with autism spectrum disorder in Ireland. *Research in Autism Spectrum Disorders*, 3, 474–482.
- Newman, I., Leader, G., Chen, J. L., & Mannion, A. (2015). An analysis of challenging behavior, comorbid psychopathology, and attention-deficit/hyperactivity disorder in fragile X syndrome. *Research in Developmental Disabilities*, 38, 7–17.
- Pavlovic, M., Zunic-Pavlovic, V., & Glumbic, N. (2013). Students' and teachers' perceptions of aggressive behaviour in adolescents with intellectual disability and typically developing adolescents. *Research in Developmental Disabilities*, 34, 3789–3797.
- Peduzzi, P., Concato, J., Kemper, E., Holford, T. R., & Feinstein, A. R. (1996). A simulation study of the number of events per variable in logistic regression analysis. *Journal of Clinical Epidemiology*, 49(12), 1373–1379.
- Poppes, P., Van der Putten, A. J. J., & Vlaskamp, C. (2010). Frequency and severity of challenging behaviour in people with profound intellectual and multiple disabilities. *Research in Developmental Disabilities*, 31, 1269–1275.
- Rojahn, J., Matson, J. L., Lott, D., Esbensen, A. J., & Smalls, Y. (2001). The behavior problems Inventory: An instrument for the assessment of self-injury, stereotyped behavior and aggression/destruction in individuals with developmental disabilities. *Journal of Autism and Developmental Disabilities*, 31, 577–588.
- Ruddick, L., Davies, L., Bacarese-Hamilton, M., & Oliver, C. (2015). Self-injurious, aggressive and destructive behaviour in children with severe intellectual disability: Prevalence, service need and service receipt in the UK. *Research in Developmental Disabilities*, 45–46, 307–315.
- Simó-Pinatella, D., Alomar-Kurz, E., Font-Roura, J., Gine, C., Matson, J. L., & Cifre, I. (2013). Questions about behavioral function (QABF): Adaptation and validation of the Spanish version. *Research in Developmental Disabilities*, 34, 1248–1255.
- Symons, F. J., Clark, R. D., Hatton, D. D., Skinner, M., & Bailey, D. B. (2003). Self-injurious behavior in young boys with fragile X syndrome. *American Journal of Medical Genetics*, 118A, 115–121.
- van Gamen-Oosterom, H. B. M., Fekkes, M., van Wouwe, J. P., Detmar, S. B., Oudesluys-Murphy, A. M., & Verkerk, P. H. (2013). Problem behavior of individuals with down syndrome in a nationwide cohort assessed in late adolescence. *The Journal of Pediatrics*, 5, 1396–1401.