The role of key skills as a risk marker for the development of challenging behaviour in children and young people who have an intellectual disability

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Abstract

Background: Previous research has considered various risk factors associated with the development of challenging behaviour in children and young people who have an intellectual disability. This study extended the literature by exploring the role of key skills, as measured by the Essential Eight questionnaire, as possible risk factors.

Method and materials: Participants were 144 pupils at a primary special school. The Problem Behaviour Inventory – Short Form – Schools (Rojahn et al, 2012a and b), and the Essential Eight questionnaire (from the Essential for Living curriculum; McGreevy, Fry and Cornwall, 2012) were completed for each pupil.

Results: Scores on the Essential Eight questionnaire correctly classified 83% of pupils as having, or not having, challenging behaviour. Pupils with the lowest skills had a 93% chance of having challenging behaviour; those with the highest skills had a 13% chance.

Conclusion: The lack of key skills (in communication, tolerance and daily living skills) is an important risk factor for the development of challenging behaviour.

Keywords: Challenging behaviour, children, Essential for Living, intellectual disability, risk factor, skills

Introduction

Studies have highlighted that children and young people who have an intellectual disability are at significant risk of exhibiting behaviour that is challenging to themselves and others (Simó-Pinatella, Mumbardó-Adam, Alomar-Kurz, Sugai, and Simonsen, 2019), that this behaviour tends to persist over time (Bailey, Totsika, Hastings, Hatton and Emerson, 2019; Chadwick, Kusel, Cuddy and Taylor, 2005; Rattaz, Michelon, Munir and Baghdadli, 2018) and has a substantial impact on the children themselves, their families and school staff (Kelly, Carey, McCarthy and Coyle, 2007; McGill, Tennyson, and Cooper, 2006; Pilling, McGill and Cooper, 2007). The nature and impact of this behaviour has led researchers to seek an understanding of the risk factors that lead children to develop such behaviour, to look for ways to prevent the development of this behaviour, and to develop effective ways to intervene to address the behaviour once it is established.

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Research into risk factors has explored a range of possible markers including child characteristics (such as age, gender, diagnosis, sensory impairment) (Schroeder et al, 2014), specific behavioural markers (such as repetitive or ritualistic behaviour, or impulsive behaviour) (Davies and Oliver, 2016) and child skills (such as communication, adaptive behaviour, social skills) (Chadwick, Piroth, Walker, Bernard and Taylor, 2000; Duerden et al, 2012). In addition, studies have also considered the role of broad environmental risk factors (such as parental income and education, number of hours of intervention offered) (Murphy, Healy and Leader, 2009; Schroeder et al, 2014). There are significant methodological difficulties with this literature, as studies have varied considerably in the populations they have included, and there is little consistency in the measures used for the key variables (Simó-Pinatella et al, 2019). One study that has provided a clear and easily replicable methodology for measuring challenging behaviour (CB) is Nicholls, Hastings and Grindle (2020). This study used The Behaviour Problems Inventory for Individuals with Intellectual Disabilities – Short Form – Schools Version (BPI-S-Schools) to measure the prevalence of CB in a UK special school. The BPI-S-Schools is an easily administered questionnaire and the study provides clear, replicable, definitions for CB. In addition to the methodological difficulties, there are also theoretical difficulties with this literature. Although some studies have outlined the mechanism through which the risk factors studied may impact the development of CB (Davies and Oliver, 2016), this is not true of all the studies and therefore, even when risk factors have been identified, it is not always clear how this information can be used to reduce the risk, or mitigate the impact, of a child developing CB.

The second approach to exploring CB has been to consider the treatment approaches that can reduce it once it is established (LaVigna and Willis, 2012). Positive behavioural support (PBS) is recognised as an effective and ethical way of supporting people with intellectual disabilities who are at risk of behaviour that challenges. Its primary goal is to improve the quality of life of the person and of those around them, and in so doing to reduce the likelihood of challenging behaviour in the first place (LaVigna and Willis, 2012). It is the basis of recommendations in a number of policy documents in the UK (Denne et al, 2020). Based on applied behaviour analysis (ABA), PBS provides a clear theoretical framework for understanding the development of CB (Gore et al, 2013). This approach highlights that CB often results from an interaction between a person's biological and psychosocial vulnerabilities and the social environment around them, and argues that the function of CB for the person concerned usually relates to a need to access something (such as to gain an interaction with others, or a sensory experience) or to avoid something (such as a difficult situation or managing unrecognised pain) (Hastings et al, 2013). The interventions needed to support a person who has behaviour that is challenging to others thus need to be tailored to their specific vulnerabilities and social environment, and to the function of their behaviours; they are multi-elemental and focus on quality of life (LaVigna and Willis, 2012).

Although when working within a PBS framework the focus of interventions is at an individual level, PBS has successfully been used as a whole-systems approach, notably within school settings to support behavioural issues (Solomon, Klein, Hintze, Cressey and Peller, 2012). To date, much of the research around school-wide applications of PBS (SW-PBS) has come from mainstream settings in the USA (Borgen, Kirkebøen, Ogden, Raaum and Sørlie, 2020). Experience of PBS within UK schools has, until recently, typically been conducted in special needs settings (special schools and special needs resource bases within mainstream settings) and tended to focus on interventions used to address the challenging behaviour of specific pupils (Jackson Brown, Gillard, Brown, Anderson and Stewart, 2014; Paris et al, 2019). Increasingly, those schools with some experience of PBS are beginning to look at interventions across the whole school setting, adopting key elements of the PBS framework adapted to their own environments. One such element is the development of personal skills. LaVigna and Willis (2012) suggest that interventions that enable the development of general skills (such as self-help skills), 'functionally equivalent skills' (such as an ability to request an item), 'functionally related skills' (such as the ability to make a choice) and 'coping and tolerance skills' (such as waiting) are an intrinsic element of an effective plan to reduce CB (LaVigna and Willis, 2012, p186). This approach to understanding CB is based upon a clear theoretical understanding of the mechanisms through which CB develops. It suggests that CB can be best addressed through a multi-element plan, some elements of which will vary from one individual to another, but a consistent element of which is the need to develop skills in specific areas. Ala'i-Rosales et al (2019) argue that decades of functional assessment research suggest that proactively teaching children skills in communication, gaining attention, engaging in play and leisure skills, and coping skills may prevent the development of CB.

The argument regarding the importance of skills building for children who have an intellectual disability, and the clarification of what these skills should be, is taken further

by McGreevy, Fry and Cornwall (2014) who developed the Essential for Living (EfL) curriculum. EfL is a skills teaching curriculum, based on ABA, designed for children and adults who have moderate to severe disabilities. The authors of this curriculum argue that without a core set of skills 'children and adults with disabilities will almost certainly exhibit forms of problem behavior, will have limited access to preferred items, activities, places and people, and will have limited contact and interaction with the community in which they live' (McGreevy et al, 2014, p2). The authors identify eight core skills defined as the Essential Eight (E8) and provide an assessment tool to measure these skills. The E8 questionnaire consists of eight questions related to three key skill areas – functional communication (the ability to request an item), tolerance (the ability to wait, accept removals, complete previously acquired tasks, accept 'no', follow directions and tolerate unpleasant situations related to health and safety) and daily living skills (the ability to complete the skills needed to remain healthy and safe). These skills map onto the general classes of skills highlighted by LaVigna and Willis (2012), and those suggested by Ala'i-Rosales et al (2019).

Consideration of the current literature on risk factors also suggests some support for the idea that a difficulty in acquiring these skills is important in the development of CB. For example, Baghdadli, Picot, Pry, Michelon, Burzstejn, Lazartigues and Aussillioux (2008) found that initial expressive communication ability is a strong predictor of later CB. In addition, two studies which have explored the role of tolerance as a risk factor, either by exploring 'coping skills' (Williams, Siegel and Mazefsky, 2018) or 'behavioural flexibility' (Peters-Scheffer, Didden, Sigafoos, Green and Korzilius, 2013), report strong associations between these factors and behavioural difficulties. Both studies focused specifically on children and young people with autistic spectrum disorder (ASD). Studies have also reported associations between CB and 'adaptive behaviour' or daily living skills measured in various ways. (Chadwick et al, 2000; Nicholls et al, 2020). Although individual studies have considered specific skills, we could find no study to date which has examined the association between the three key skill areas noted above and CB.

This study therefore aimed to build on the existing literature in two respects. Firstly, by replicating the methodology of Nicholls et al (2020), the study aimed to gain comparative information about the prevalence of CB in a UK special school. Secondly, the study aimed to examine the hypothesis, asserted by McGreevy and colleagues, that a lack of skills in the three key areas of functional communication,

tolerance and daily living skills (as measured by the E8) is a risk factor for the development of CB. Given that this is the first study that we are aware of that has used the E8, the study explored this question in several ways. It considered whether there is an association between a child's profile across all eight skill areas in the E8 and CB (as suggested by McGreevy and colleagues), whether there are any 'key' skills within the E8 skills that have specific importance, and how a child's chance of having CB varies across different E8 profiles.

Method

Setting

All the participants in the study were pupils at a local authority maintained primary special school in London. In the UK, special school education is offered to children who struggle within mainstream education, and hence the children attending special schools have the greatest level of need academically, emotionally and behaviourally. The school has 173 pupils on roll between the ages of four and eleven years. The school has 19 teaching staff, four instructors, 86 teaching assistants and three therapy staff in full time positions, and two part time therapy staff.

All the pupils at the school have an education, health and care plan (EHCP). The EHCP is an assessment, completed by the local authority with input from the child themselves, their family and other professionals, that sets out a child's educational, health and social care needs and the support they require. The EHCP highlights the child's primary need. The majority of pupils at the school have a primary need of ASD and, in addition, an intellectual disability.

The classes within the school are organised according to ability and the children within each class have a mix of diagnoses. Most of the classes have a ratio of approximately ten pupils to five teaching staff. These classes use a mix of approaches developed for teaching young people who have ASD (as the majority of pupils within the school have ASD). In addition, some pupils have extra modifications such as working in a separate room off the main classroom, or one-to-one support. The school also has three designated EfL classes in which there are 23 students and 23 staff (pupils are taught on a 1:1 ratio). These classes implement the EfL program (McGreevy et al, 2014). The pupils in these classes have been identified by the school as not making progress following the school's usual developmental curriculum.

Participants

The participants in the study were 144 pupils at the school (please see the procedure section for how these pupils were selected). Table 1 summarises the key characteristics of the pupils. The majority of the participants were aged between seven and eleven, male and had a primary need of ASD. More than 50% of the participants had English as an additional language at home.

Table 1: Pupil characteristics

Characteristic		Summary statistic – N (%)
Age in key stage	Key stage 1 (ages 5–7)	37 (25.7%)
	Key stage 2 (ages 7–11)	107 (74.3%)
Gender	Male	115 (79.9%)
	Female	29 (20.1%)
Eligible for free school meals		46 (31.9%)
Primary need of ASD		127 (88.2%)
English as an additional language at home		82 (56.9%)

Abbreviation: ASD, autistic spectrum disorder

Measures

Individual data
Data about each pupil's characteristics were taken from the school's information database. Assignment of a diagnosis of ASD was based on the primary need stated on the EHCP. Eligibility for free school meals is taken as a measure of socioeconomic status as children are only eligible for free school meals if the family income is low or the family receives certain benefits.

The Behaviour Problems Inventory for Individuals with Intellectual Disabilities – Short Form – Schools Version (BPI-S-Schools)

The BPI-S-Schools (Nicholls et al, 2020) is an adaptation of the Behaviour Problems Inventory – short form (Rojahn et al, 2012a) which was developed to make the measure more applicable to young people.

The original Behaviour Problems Inventory-01 (Rojahn, Matson, Lott, Esbensen and Smalls, 2001) is an informant-based behaviour rating instrument designed to measure self-injurious, stereotypic and aggressive/ destructive behaviour in adults who had an intellectual disability. Rojahn, Rowe, Sharber, Hastings, Matson, Didden, Kroes and Dumont (2012a) developed the short form to make the measure easier to use, particularly for research or the evaluation of groups. The BPI-S-Schools was developed by Nicholls et al (2020) from the BPI-S to ensure its suitability for children who have an intellectual disability.

The BPI-S-Schools has 32 items divided into three subscales – self-injurious behaviour (SIB) containing 10 items, aggressive/destructive behaviour (ADB) containing 10 items and stereotyped behaviour (STB) containing 12 items. The SIB and ADB subscales are rated on two Likert-type scales: a frequency scale, which contains five points (never, monthly, weekly, daily, hourly); and a severity scale containing three points (mild, moderate, severe). A mild rating is defined as behaviour that does not inflict significant damage to the individual or others (eg temporary reddening of the skin, very light bruising), or disruption or mild damage to property (eg objects thrown, furniture tipped over) but the item does not require repair or replacement. A moderate rating is defined as behaviour that causes moderate damage to the individual or others (eg moderate bruising, scratching through the skin), or moderate damage to property (eg curtains torn, furniture partly broken) such that the item can be used but requires repair. A severe rating is defined as behaviour that causes moderate to severe damage to the individual or others (eg biting through the skin, eye gouging) which requires medical intervention, or significant damage to property such that the item cannot be used and requires repair. The STB subscale is rated on an eight-point Likert-type scale for frequency (never, fewer than once a month, about once a month, about once a week, about once a day, about once an hour, more than once an hour, once a minute or more).

The BPI-S has good psychometric properties (Rojahn et al, 2012b) and Nicholls, Hastings and Grindle (2020) reported that the BPI-S-Schools had good to excellent internal consistency in their sample. Given the small sample size of the current study, Cronbach's alphas are not reported.

The Essential Eight (E8)

The E8 is a subset of eight questions within the Essential for Living Quick Assessment, which forms part of the EfL curriculum (McGreevy et al, 2014). The Quick Assessment is designed to suggest areas of need in a range of basic functional skills. It can be completed either by interviewing a parent or carer, or direct observation.

The skills included in the E8 are making a request, waiting, accepting removals/transitions/sharing/turn taking, completing tasks when requested, accepting 'no', following directions related to health and safety, completing daily living skills related to health, and safety and tolerating situations in relation to health and safety.

Each skill is rated on an individually defined four-point scale. The points on each scale do not follow a common pattern and are qualitatively different within and between skills. However, in all skill areas, 1 represents the lack of a skill, 2 the early emergence of the skill, 3 skill in the course of acquisition and 4 represents competency. For example, the scale points for waiting are: 1 point – exhibits problem behaviour when access is delayed for a few seconds; 2 points – waits for one minute with complaints or minor disruption; 3 points – waits for five minutes without complaint; 4 points – waits for 20 minutes without complaint.

There is no published reliability or validity data for the E8, as it was developed as part of a skills building program focused on developing skills to improve quality of life, and there are no norms or norm-referenced tests of quality of life with which to compare it. The E8 is a set of skills that the authors, with 60 years of combined experience working with children and adults with developmental disabilities and severe problem behaviour, view as essential to quality of life and without which problem behaviour often occurs (P McGreevy, personal communication, 8 January 2021). This study uses pupils' scores on the individual skills, and not their score on the scale as a whole, and therefore the internal consistency of the scale as a whole was not calculated.

Procedure

The study was reviewed and approved by the Humanities and Social Sciences Research Ethics Committee for the University of Warwick. Of the 173 pupils on roll at the school, 158 of the pupils were included as possible participants in the study. The remaining 15 pupils had only recently joined the school and thus the school held the view that teachers would not know them well enough to be able to accurately report on their skills and behaviour. An opt out letter was sent to parents/carers of all the 158 pupils and four chose to opt out, resulting in 154 possible participants.

The measures were completed by the lead researcher during interviews with each of the class teachers. Data were collected between mid-February and March 2020. All the teachers, apart from two, had taught their class since at least September 2019. A further 10 pupils were excluded from the study at this stage, as it was considered that the two class teachers who had changed since September had not known the pupils long enough to be able to accurately complete the questionnaires.

The demographic data related to the participants was abstracted from the school records in February 2020.

There was no data missing from the questionnaires.

Data reduction and analysis

Variables from the demographic data were collated into categories where needed – the presence or absence of ASD as a primary need, the presence or absence of English as an additional language at home, and the presence or absence of eligibility for free school meals. Month and year of birth were used to assign pupils to key stages.

The information from the BPI-S-School was coded using the definitions for CB outlined by Nicholls et al (2020). The results were then categorised into the presence or absence of CB within each of the subtypes (SIB, ADB, STB) and the presence or absence of CB overall.

The E8 has not been used in research before and there is no information about how best to code it. To explore the most sensitive way to do this, we chose to code it in two different ways, firstly into the presence or absence of each individual skill, then into a pass or fail of the E8 overall. Both ways of coding the data were applied using three different cut-off points. At cut-off one, a skill was coded as absent if the score was one and present if the score was two, three or four; at cut-off two, the skill was coded as absent if the score was one or two and present if the score was three or four; at cut-off three, the skill was coded as absent if the score was one, two or three and present if the score was four. The coding of the pass or fail of the E8 as a whole was based on the presence or absence of all of the skills at the different cut-off points. A pass was assigned if the pupil had all of the skills present at that cut-off point.

The data were analysed using SPSS version 25. Prevalence scores were determined for each of the individual types of CB and the combinations. Prevalence was described as a percentage with 95% confidence intervals based on the proportion of the sample meeting the definitions in Nicholls et al (2020).

Logistic regression models were used to examine the most sensitive cut-off score on the E8 for predicting each type and any type of CB. Dichotomously coded CB (present or absent) was the dependent variable and each of the individual skills (coded present or absent) and the E8 overall (coded pass or fail) were the independent variables for each of the cut-off levels. All predictors were entered into the regression model together and evaluated for their independent contribution to the prediction of CB.

Conditional probabilities were calculated using the E8 overall (coded pass or fail) at each cut-off point to examine the association between the pupil's E8 overall and the presence of any type of CB.

Table 2: Prevalence of each type, and combinations of types, of challenging behaviour

Type of challenging behaviour	Prevalence (%)	95% confidence interval
SIB	28.5	[22.2, 35.4]
ADB	46.5	[39.6, 54.2]
STB	36.1	[29.2, 43.8]
Any type of CB	66.0	[58.3, 72.9]
SIB and ADB	19.4	[13.9, 25.0]
STB and SIB	17.4	[12.5, 22.9]
ADB and STB	22.2	[16.0, 28.5]
SIB, ADB and STB	13.9	[9.0, 18.8]

Abbreviations:
ADB, aggressive/ destructive behaviour;
CB, challenging behaviour;
SIB, self-injurious behaviour;
STB, stereotyped behaviour.

Results

Prevalence of challenging behaviour

The prevalence of each type, and combinations of types, of CB are shown in *Table 2*. When the definitions outlined in Nicholls et al (2020) were applied to the data from the BPI-S-Schools, 66% (95% CI [58.3, 72.9%]) of the pupils met the criteria for having CB. ADB was the most prevalent type of CB at 46.5% (95% CI [39.6, 54.2%]), STB was displayed by 36.1% (95% CI [29.2, 43.8%]) and SIB by 28.5% (95%CI [22.2, 35.4%]). All three types of behaviour were displayed by 13.9% (95% CI [9.0%, 18.8%]).

Sensitivity of cut-off points on the Essential Eight for predicting challenging behaviour

The results of the logistic regression analysis for each and any type of CB and the E8 overall are summarised in *Tables 3, 4 and 5* below.

Table 3: Logistic regression analysis using a cut-off of one on the Essential Eight

Type of challenging behaviour	Cox and Snell RS square	Nagelkerke R square	Percentage correctly classified
SIB	0.163	0.233	75.7
ADB	0.399	0.533	79.2
STB	0.252	0.345	72.2
Any type of CB	0.425	0.588	83.3

Abbreviations:
ADB, aggressive/ destructive behaviour;
CB, challenging behaviour;
SIB, self-injurious behaviour;
STB, stereotyped behaviour.

Table 4: Logistic regression analysis using a cut-off of two on the Essential Eight

Type of challenging behaviour	Cox and Snell RS square	Nagelkerke R square	Percentage correctly classified
SIB	0.223	0.319	77.8
ADB	0.425	0.568	79.9
STB	0.252	0.345	74.3
Any type of CB	0.393	0.544	83.3

Abbreviations:
ADB, aggressive/ destructive behaviour;
CB, challenging behaviour;
SIB, self-injurious behaviour;
STB, stereotyped behaviour.

Table 5: Logistic regression analysis using a cut-off of three on the Essential Eight

Type of challenging behaviour	Cox and Snell RS square	Nagelkerke R square	Percentage correctly classified
SIB	0.223	0.319	75.7
ADB	0.414	0.552	80.6
STB	0.229	0.300	72.9
Any type of CB	0.356	0.492	81.3

Abbreviations:
ADB, aggressive/ destructive behaviour;
CB, challenging behaviour;
SIB, self-injurious behaviour;
STB, stereotyped behaviour.

Using a cut-off of one on the E8 overall (ie a pass criterion of a pupil scoring two or more on all the skills in the E8), or a cut-off of two on the E8 overall (ie a pass criterion of a pupil scoring three or more on all the skills in the E8) correctly classifies 83.3% of the sample in relation to the presence or absence of CB. However, the two cut-off points differ in their classification of the specific types of CB. The cut-off of one correctly classifies less of the individual types of CB (75.7.8% of pupils with SIB, 79.2% of pupils with ADB and 72.2% of pupils with STB) than does the cut-off of two (77.8% of pupils with SIB, 79.9% of pupils with ADB and 74.3% of pupils with STB).

Individual skills as predictors of challenging behaviour

Using a cut-off of two, the results of the logistic regression analysis for each and any type of CB and each of the individual skills are summarised in *Table 6* below.

Using the *p* value of .05, completing daily living tasks is a significant independent correlate for both SIB (B = -1.971, *p* = .002) and STB (B = -1.518, *p* = .005), and both accepting no (B = -1.933, *p* = .011) and tolerating situations are significant independent correlates for ADB (B = -1.537, *p* = .007). Waiting (B = -1.585, *p* = .044) is a significant predictor for any type of CB.

Conditional probability of any type of challenging behaviour for different cut-off points on the Essential Eight

The 2x2 tables and conditional probabilities of any type of CB for the different cut-off levels are summarised in *Tables 7 through 10* below.

The tables show that the conditional probability of a pupil having any type of CB decreases as their E8 score increases. The greatest probability of having any type of CB is if the E8 scores include a score of one (P(CB|Fail) = .93). The probability decreases if the E8 scores are all two or more (P(CB|Passtwo) = .31), decreases further if all of the scores are three or more (P(CB|Passthree) = .23), and decreases further still if all the scores are four (P(CB|Passfour) = .13). In this sample if a pupil has a score of one on the E8, there is a 93% chance that they will have CB. If a pupil scores four on all of the skills their chances of having CB is 13%.

Table 6: Logistic regression analysis for each of the individual skills

Type of challenging behaviour	Skill	B	Sig.
SIB	Making requests	0.011	0.987
	Waiting	-0.807	0.182
	Accepting removals	-0.662	0.310
	Completing 10 tasks	0.945	0.159
	Accepting no	0.105	0.892
	Following directions	0.568	0.390
	Completing daily living tasks	-1.971	0.002
	Tolerating situations	-0.095	0.852
ADB	Making requests	-0.057	0.942
	Waiting	-1.099	0.070
	Accepting removals	-0.604	0.309
	Completing 10 tasks	0.697	0.306
	Accepting no	-1.933	0.011
	Following directions	0.432	0.511
	Completing daily living tasks	-0.513	0.427
	Tolerating situations	-1.537	0.007
STB	Making requests	-0.167	0.794
	Waiting	-0.473	0.387
	Accepting removals	-0.486	0.400
	Completing 10 tasks	0.228	0.685
	Accepting no	0.720	0.268
	Following directions	0.098	0.862
	Completing daily living tasks	-1.518	0.005
	Tolerating situations	-0.600	0.210
Any type of CB	Making requests	-1.305	0.293
	Waiting	-1.585	0.044
	Accepting removals	-0.573	0.406
	Completing 10 tasks	0.298	0.669
	Accepting no	-0.706	0.321
	Following directions	0.294	0.673
	Completing daily living tasks	-0.750	0.304
	Tolerating situations	-1.651	0.055

Abbreviations:
ADB, aggressive/ destructive behaviour;
CB, challenging behaviour;
Sig, significance level
SIB, self-injurious behaviour;
STB, stereotyped behaviour.

Table 7: Two-by-two table using an Essential Eight cut-off of one

	Has any type of challenging behaviour	No challenging behaviour	Totals
Pass Essential Eight	19	43	62
Fail Essential Eight	76	6	82
Totals	95	49	144

Table 8: Two-by-two table using an Essential Eight cut-off of two

	Has any type of challenging behaviour	No challenging behaviour	Totals
Pass Essential Eight	9	30	39
Fail Essential Eight	86	19	105
Totals	95	49	144

Table 9: Two-by-two table using an Essential Eight cut-off of three

	Has any type of challenging behaviour	No challenging behaviour	Totals
Pass Essential Eight	2	13	15
Fail Essential Eight	93	36	129
Totals	95	49	144

Table 10: Conditional probability of a participant having any type of challenging behaviour for each cut-off point

Cut-off point for all skills on the Essential Eight	Conditional probability of having any type of challenging behaviour (to two decimal places)
Fail cut-off one (any skill scored at a one)	0.93
Pass cut-off one (all skills scored at two or more)	0.31
Pass cut-off two (all skills scored at three or more)	0.23
Pass cut-off three (all skills scored at four)	0.13

Discussion

The prevalence figures obtained in this study are higher than those reported in the Nicholls et al study (2020) with 66% (95% CI [58.3, 72.9] of pupils having some form of CB compared to 53% in that study, and 13.9% (95% CI [9.0, 18.8]) having all three types of CB compared to 9.3%. One possible reason for the differences between the studies is that a greater number of the pupils in this study had a primary need of ASD, 88.2% compared with 43.3% in the Nicholls et al study. Given that ASD is a risk factor for CB (Nicholls et al, 2020), it would be expected that this would influence the rates of CB reported. The results from this study also show a different pattern in relation to the specific types of CB with ADB being the commonest (46.5% (95% CI [39.6, 54.2])), then STB (36.1% (95% CI [29.2%, 43.8%])) then SIB (28.5% (95%CI [22.2%, 35.4%])). Again, the explanation for this difference may lie in the demographics of the pupils studied.

This study also explored the association between a pupil's skill level in three key areas – communication, tolerance, and daily living skills – as measured by the E8, and their level of CB. This is the first time that the E8 has been used in this way and so various questions were explored. The first question that was considered was whether a pupil's scores on all of the E8 skills showed an association with the presence of CB, and if so, which was the most sensitive cut-off point to choose for a pupil passing or failing the E8. The results of the logistical regression show that both a cut-off of one (ie the pupil passes the E8 if they have a score of two or more on all of the skills in the E8) and a cut-off of two (ie the pupil passes the E8 if they have a score of three or more on all of the skills in the E8) correctly

classifies whether 83.3% of pupils do, or do not, have any form of CB. However, the analysis also showed that using the cut-off of two provides slightly better classification for the specific types of CB. These results therefore suggest that measuring a pupil's skills using the E8 and using a pass/fail criterion of a cut-off of two is a good predictor of whether a pupil will have any form of CB.

The second area explored was whether there are any specific skills within the eight E8 skills that are significant predictors of CB on their own. The results show that daily living skills, accepting no and tolerance of situations are predictors of specific types of CB (daily living skills predicting SID and STB, and accepting no and tolerance of situations predicting ADB). In addition, waiting is a significant predictor of any form of CB. This suggests that a range of skills are important and that as McGreevy et al (2014) themselves suggest, it is best to view the E8 as eight essential skills, rather than focusing on particular skills within that group.

Finally, the data were analysed to look at how a pupil's level of CB varies depending on their skill level on the E8. These results show that as a pupil's skill level increases, their chances of having CB decreases from 93% (if at least one of their skills is rated at one), to 13% (if all of their skills are rated at four).

The results of this study therefore suggest that a pupil's key skill level, as measured by the E8, is a significant predictor of their likelihood of exhibiting CB, and that as a pupil's skill level rises their level of CB decreases. These findings are in line with previous studies looking at communication (Baghdadli et al, 2008), tolerance (Peters-Scheffer et al, 2013; Williams et al, 2018) and daily living skills (Chadwick et al, 2000; Nicholls et al, 2019) as risk factors for CB, and with intervention studies based on ABA that suggest that support for people who have CB should include teaching these key skills (LaVigna and Willis, 2012). The findings from this study are also in line with the suggestions from Ala'i-Rosales et al (2019) that a child's abilities in communication, gaining attention and coping skills are key skills in the prevention of CB. There is a clear theoretical rationale for why these particular skills are important, and the E8 provides an easy way to measure them. The EfL package (McGreevy et al, 2014) also provides a curriculum for teaching these skills. Given the significant negative impact of CB on the children themselves, their families and school staff, it is important to explore ways to reduce the likelihood of CB. The results from this study suggest that focusing on monitoring and teaching these key skills within a UK special school offers a way to do this.

In considering these results there are several limitations that it is important to acknowledge. The most significant limitation of this study is that it is based on the population of one school, with a relatively small sample size, so it is not clear that the results would generalise to other schools. A further limitation is the subjectivity of the teachers' ratings of their pupils' skills and behaviour and the lack of test-retest reliability data. Future studies should replicate this study in other schools and gather both test-retest data and concurrent validity data for the E8. A strength of the research is that the methodology is clear and easily replicated.

An additional area to consider in interpreting these results is that the data collected were limited to the variables included on the BPI-S-Schools and the E8. In collecting these data it was clear that some pupils exhibited a form of CB not included on the BPI-S-Schools, such as absconding, or putting themselves on the floor. In addition, it was also clear that there are some limitations with the E8, particularly for pupils who have less severe disabilities. The authors note that EfL is a package for people who have moderate and severe disabilities. Research suggests that many of the items on the scale are equally important to people with less severe disability. For example the 'tolerance' items, such as accepting removals, are very similar to items included in the Behavioral Flexibility Scale – Revised (Peters-Scheffer et al, 2008) which has been used with children with any level of intellectual disability, and has shown associations with emotional and behavioural difficulties (Peters-Scheffer et al, 2013). However, there are some items that may need to be altered for pupils with a higher ability level. Most notably the communication item in the E8 focuses on a person's ability to make requests. For young people with greater communication skills, this item is easily passed; however, these young people may still struggle with aspects of social communication, particularly with their peers (Williams et al, 2018) and the E8 does not capture this. A further limitation with the current E8 that would apply to all children, and which McGreevy and Fry (2021) have discussed, is the lack of inclusion of play and leisure skills as highlighted in the Ala'i-Rosales et al (2019) paper.

Finally, in considering the results from this study it is important to note that this study was a cross-sectional design. It would be important to develop an intervention study to be able to assert that increasing a child's skills reduces the likelihood of them displaying CB.

Implications for practice

This study, like the Nicholls et al (2020) study, suggests that there is a significant level of CB within special schools in the UK. This is important for practice, as it suggests that schools need help to address this and consider how best to support pupils who have CB. Given that CB tends to persist over time, arguably it is important that this support does not just focus on ways to contain or respond to CB if it occurs within school, but actively seeks to find ways to reduce CB in the longer term.

This study, if replicated and generalised, also suggests that an appropriate way to reduce pupils' CB in the longer term, and therefore increase the quality of life of these pupils and their families, may be to increase their skill levels in a few key skill areas. In addition, the study suggests a tool for measuring change in these skills. If intervention studies show that increasing a child's performance in these key areas reduces their CB, it would have important implications for practice, suggesting the need to monitor and teach these skills both at home and at school to prevent CB. It would also suggest that special schools within the UK may benefit from considering the empirical literature on school-wide PBS (Borgen et al, 2019; Park, Lee and Kim, 2019), and exploring how this whole-school, multi-tiered approach could be implemented and adapted within the special education sector in the UK. Further research is needed in this area.

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