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'Key skills' building in schools as a possible approach to reducing and preventing challenging behaviour

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Abstract

Background: Building 'key skills' may help prevent the development of challenging behaviour in children with an intellectual disability. The aim of this paper was to extend the current limited evidence in this area.

Method: We undertook two studies with children with an intellectual disability in school settings: (1) a cross-sectional replication study exploring the relationship between 'key skills' and challenging behaviour. (2) a longitudinal study follow-up exploring change in 'key skill' levels and challenging behaviour.

Results: The replication study recruited 74 participants, those scoring lowest in 'key skill' had a 94% chance of having challenging behaviour; those with the highest scores had a 6% chance.

The follow-up study recruited 39 participants, we found a significant increase in children's 'key skill' level ($p < .001$) and a decrease in their challenging behaviour ($p = .046$).

Conclusion: Building 'key skills' in children with an intellectual disability may help reduce or prevent challenging behaviour.

KEYWORDS
challenging behaviour, intellectual disability, prevention, risk marker, skills development

1 | INTRODUCTION

Children and young people with an intellectual disability are at greater risk of developing behaviour which is challenging to others; such behaviour develops early, persists over time and has a substantial impact on the child and those around them (Emerson & Einfeld, 2010; Gore et al., 2014). Despite this, much clinical practice is focused on tackling such behaviour once established, rather than on prevention (Allen et al., 2013; Fahmie & Luczynski, 2018; Petrenko, 2013). Fahmie and Luczynski (2018) argue that two possible reasons for this are a lack of clarity about risk markers for the development of challenging behaviour, and that studies regarding skills building have not been evaluated in this way.

Researchers have explored a range of risk markers for challenging behaviour including factors associated with the individual (e.g., age, gender, severity of intellectual disability, mental health needs, skills in communication; Bowring et al., 2017; McClintock et al., 2003; Melville et al., 2016; Murphy et al., 2009), and factors associated with the environment around the individual (e.g., type of accommodation, intervention received; Bowring et al., 2019; McTiernan et al., 2011). The risk marker literature is problematic because of its heterogeneity; studies have focussed on different populations, risk markers and behaviours, with variations in methods used, and the results are mixed (Esteves et al., 2021; Lang et al., 2013; McClintock et al., 2003). Moreover, theoretical studies relating risk markers to the emergence of challenging behaviour are limited. Hastings et al. (2013) propose that

TABLE 1 The 'key skills' are measured by the Essential Eight questionnaire (McGreevy et al., 2012).

Skill	Descriptor
Making requests	The tendency to make requests for highly preferred items and activities
Waiting	The tendency to wait when access to items or activities is delayed after a request
Accepting removals, making transitions, sharing and taking turns	The tendency to accept the removal of preferred items and activities by persons in authority or peers, to make transitions from preferred activities to non-preferred ones, and to share and take turns with, preferred ones
Completing 10 Consecutive, brief, previously acquired tasks	The tendency to complete brief, previously acquired tasks between opportunities to make requests.
Accepting 'No'	The tendency to accept 'no' when access to items or activities is denied following requests that were taught and requests for dangerous items and activities that were not taught.
Following directions related to health and safety	The tendency to follow directions from others that ensures safety and that permits safe movement throughout the community
Completing daily living skills related to health and safety	The tendency to perform daily living skills which have an immediate impact on the health and safety of the learner.
Tolerating situations related to health and safety	The tendency to tolerate unpleasant situations which have an immediate impact on the health and safety of the learner

an interaction between biological and psychosocial vulnerabilities results in the emergence of challenging behaviour, which is then maintained through reinforcement either internal or external. This idea was developed further by Bowring et al. (2019) who suggest the additional importance of 'cumulative risk'—exposure to multiple risk factors. Neither model, however, outlines the mechanism by which the vulnerabilities develop into challenging behaviour.

Oliver (1993) offers a model for self-injurious behaviour (SIB), which suggests a role for both predisposing factors (i.e., biological and psychosocial vulnerabilities) and also mediating processes. Mediating processes stem from the underlying vulnerabilities but provide the more specific circumstances within which SIB emerges. He highlights that SIB may emerge if a person's communication does not influence their environment, if situations are more aversive for them (e.g., an autistic young person may find change or transition more difficult to manage), if certain reinforcers become more potent (e.g., if a young person has significant physical disabilities they may be more reliant on others to access reinforcers) or if there is a neurotransmitter disorder. Oliver's model therefore suggests that one important route by which specific biological or psychosocial vulnerabilities may result in challenging behaviour is via a mismatch between a young person's communication and tolerance skills and needs, and the demands of their current environment. Such behaviour may then become maintained through reinforcement (Oliver, 1993). Thus, a lack of effective communication and tolerance skills (in particular environments) may be key risk markers for challenging behaviour in those environments.

The risk marker literature around skills development has focused largely on communication, social behaviour, and adaptive behaviour (Chadwick et al., 2008; Dworschak et al., 2016; Sigafoos, 2000). Sappock et al. (2014) considered emotional development as a risk marker, suggesting that lack of skills in this area may be important, and Maddox et al. (2018) found an association between a lag in emotion regulation skills and challenging behaviour in an autistic population. However low tolerance skills have not been explicitly explored as a risk marker until a recent study (Armstrong et al., 2021) attempted to clarify whether a group of 'key skills' may mitigate the development of challenging behaviour. This study explored the role of 8 'key skills', measured by the Essential Eight (E8) questionnaire (McGreevy et al., 2012). These 'key skills' are outlined in Table 1.

They found that the chance of a child having challenging behaviour was low (13%) when all skills were present and increased to 93% when absent. The findings suggest that lack of these 'key skills' in communication, tolerance and daily living skills may be an important mediating pathway in the development of challenging behaviour. However, the study was the first to explore these skills, and the authors noted some limitations. These included that the study was correlational, there is no published psychometric data for the E8 and the study was did not explore the importance of 'key skills' in relation to other well established risk markers such as autism or severe intellectual disability (Bowring et al., 2017; Nicholls et al., 2019).

While the teaching of appropriate skills is seldom considered as preventative (Fahmie & Luczynski, 2018), some authors (Ala'i-Rosales et al., 2018; Allen et al., 2013) have highlighted the role it could play. Ala'i-Rosales and colleagues use data from functional assessments to argue that children with an intellectual disability should be proactively taught a communication strategy, how to gain attention and engage in play and leisure activities, and coping skills. Other examples of the impact of skills building on problem behaviour include a program to teach pre-schoolers, without an intellectual disability, skills in following instructions, functional communication, tolerance and friendship skills. Findings indicate an association between skills development and decreased problem behaviour (Hanley et al., 2007; Luczynski & Hanley, 2013). The intervention has since been repeated and refined including two studies with children who have developmental difficulties (including intellectual disability) (Falligant & Pence, 2017; Robison et al., 2020). The skill set in the latter study is similar to that used by Armstrong et al. (2021). The studies suggest that teaching communication and tolerance skills may reduce problem behaviour in preschool children and has the potential for use with children who have an intellectual disability. However, the study limitations include a too inclusive definition of problem behaviour and the generalisability of the findings (Robison et al., 2020).

Difficulties in communication and tolerance skills, in children and young people who have an intellectual disability, may be important risk markers in the development of challenging behaviour and could play a role in its reduction or prevention. To address the limitations in recent studies (Armstrong et al., 2021; Robison et al., 2020) there is a need for a replication and extension of the original Armstrong et al. study, there is also a need for longitudinal data to explore how the 'key skills' and challenging behaviour change over time.

1.1 | Replication study

A replication and extension of the original Armstrong et al. (2021) study.

1.1.1 | Aims

1. To examine the relationship between the 'key skills', as measured by the E8, and challenging behaviour within a different school population which includes children and young people from a wider age range and different cultural background. We hypothesised, based on the previous study, that the higher a young person's skill level, as measured by the E8, the lower their level of challenging behaviour.
2. To examine the significance of the 'key skills' as a risk marker for challenging behaviour when other more established risk factors, such as the presence of a diagnosis of autism and the child's intellectual ability, are also considered.

1.2 | Follow-up study

A longitudinal study followed the pupils included in the original Armstrong et al. (2021) study.

1.2.1 | Aims

1. To explore the change in the pupils 'key skills' and challenging behaviour over time, at a group level and at an individual level. Based on the Armstrong et al. study we hypothesised that at a group level there would be an increase in 'key skills' and a decrease in challenging behaviour. At an individual level, as the chances of having challenging behaviour decrease as a child's skill increases, we hypothesised that not all children who have increased skills would show a decrease in challenging behaviour but that those who did would have a higher final skill level than those who did not.
2. The study also aimed to explore the test/ retest properties of the E8.

2 | METHOD

2.1 | Setting

2.1.1 | Replication study

The setting was an Education Authority funded special school in Northern Ireland. A special school is a school for children and young people with an intellectual disability and whose needs are not met within mainstream education. The school had at the time of the study 220 pupils aged between 4 and 17 years, and 29 teaching staff and 60 classroom assistants. The majority of pupils were male. Classes within the school are organised according to age and the children within each class have a mix of diagnoses. Key stages 1 and 2 pupils spend most of their week with the class teacher, key stages 3 and 4 pupils receive teaching from multiple teachers.

All the pupils have a Statement of Special Educational needs (referred to as a Statement). The Statement is an assessment, completed by the Education Authority with input from the family and other professionals, that sets out a child's educational needs and the support they require. The statement will identify a child's primary need, the identification of a need of autism is based on a diagnosis from a health professional. The identification of a primary need of a moderate or severe learning disability equates to a child having an intellectual disability, identification of a severe learning disability indicates a more severe intellectual disability.

2.1.2 | Follow-up study

The setting for the second study was a Local Authority maintained primary special school in London. The school at the time had 191 pupils from 4 to 11 years of age and 123 teaching and support staff. The majority of pupils were male. Teaching within the school is delivered though three different curricula depending on the child's level of need. All of the curricula include a focus on skills development and in particular communication and tolerance skills. The curriculum for the children with the greatest level of need is based upon the Essential for Living (McGreevy et al., 2012) curriculum.

All the pupils at the school have an Education, Health and Care Plan (EHCP). The EHCP is a Local Authority assessment, that includes input from the family, the child and other professionals, which outlines a child's needs in the areas of education, health and care and the support that they require. All pupils have an intellectual disability and most also have a diagnosis of autism.

2.2 | Participants

See Section 2.4 for how the participants were recruited.

TABLE 2 Pupil characteristics in the replication study.

Characteristic		Summary statistic—*N* (%)
Age in Key stage	Key stage 1 (ages 5–8)	16 (21.6%)
	Key stage 2 (ages 8–11)	19 (25.7%)
	Key Stage 3 (ages 11–15)	24 (32.4%)
	Key stage 4 (ages 15–17)	15 (20.3%)
Gender	Male	52 (70.3%)
	Female	22 (29.7%)
Eligible for free school meals		34 (45.9%)
Primary need of moderate learning disability		67 (90.5%)
Primary need of severe learning disability		7 (9.5%)
Diagnosis of autism		40 (54.1%)
English as an additional language at home		0 (0%)

TABLE 3 Pupil characteristics in the follow-up study.

Characteristic		Summary statistic—*N* (%)
Age in years	8	6 (15.4%)
	9	12 (30.8%)
	10	12 (30.8%)
	11	9 (23.1%)
Gender	Male	28 (71.8%)
	Female	11 (28.2%)
Diagnosis of autism		37 (94.9%)
Eligible for free school meals		12 (30.8%)
English as an additional language at home		22 (56.4%)

2.2.1 | Replication study

Participants were 74 pupils at the school. Participants varied in age from 5 to 17, most were aged between 11 and 15, male and had a primary need of moderate learning disability and a diagnosis of autism. Almost 46% of the sample were eligible for free school meals. None of the pupils had English as an additional language (Table 2).

2.2.2 | Follow-up study

Participants in the follow-up group

Participants were 39 pupils at the school. Participant's ages ranged from 8 to 11, most were aged 9 or 10, male and had a diagnosis of autism in addition to an intellectual disability. Almost 31% of the participants were eligible for free school meals and a majority came from homes in which English is an additional language (Table 3).

TABLE 4 Pupil characteristics in the test–retest study.

Characteristic		Summary statistic—*N* (%)
Age in years	8	4 (21.1%)
	9	6 (31.6%)
	10	5 (26.3%)
	11	4 (21.1%)
Gender	Male	14 (73.7%)
	Female	5 (26.3%)
Diagnosis of autism		18 (94.7%)
Eligible for free school meals		6 (31.6%)
English as an additional language at home		12 (63.2%)

Participants in the test–retest group

Participants were 19 pupils at the school, these were not simply a subset of the participants in the follow-up study because some of the test–retest samples were excluded from the follow-up study, however, their characteristics are very similar. The participants ranged in age from 8 to 11, most were aged 9, male and had a diagnosis of autism in addition to an intellectual disability. Almost 32% of the participants were eligible for free school meals and a majority came from homes in which English is an additional language (Table 4).

The participants in both studies were mostly male which reflects the majority male populations from which they were drawn.

2.3 | Measures

2.3.1 | Individual data

Data about each pupil's characteristics was taken from the school's information database. Assignment of a moderate learning disability or a severe learning disability, or a diagnosis of autism, was based on the needs stated on the pupil's Statement or EHCP. Eligibility for free school meals is taken as a measure of socioeconomic status.

2.3.2 | The behaviour problems inventory for individuals with intellectual disabilities-short form—Schools version (BPI-S-School)

The BPI-S-School (Nicholls et al., 2019) is an adaptation of the Behaviour Problems Inventory—short form (Rojahn et al., 2012a) and was developed to make the measure more applicable to young people and schools. The BPI-S has good psychometric properties (Rojahn

et al., 2012b) and the BPI-S-Schools have good to excellent internal consistency (Nicholls et al., 2019). Cronbach's alpha is not reported for either of the current studies due to the small sample size.

The BPI-S-Schools has 32 items within 3 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 scales. A frequency scale, which contains 5 points (never, monthly, weekly, daily, hourly) and a severity scale containing 3 points (mild, moderate, severe). The STB subscale is rated on an 8-point Likert 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).

Arguably the inclusion of stereotypy within the definition of challenging behaviour is problematic as not all stereotypy meets the definition of challenging behaviour (Gore et al., 2022). The STB subscale was included in these studies to ensure that they were comparable to the original Armstrong et al. (2021) study.

2.3.3 | The Essential Eight

The Essential Eight (E8) is a subset of eight questions within the Essential for Living Quick Assessment, which forms part of Essential for Living (McGreevy et al., 2012). The skills included in the E8 are (1) making a request, (2) waiting, (3) accepting removals/transitions/sharing/turn taking, (4) completing tasks when requested, (5) accepting 'no', (6) following directions related to health and safety, (7) completing daily living skills related to health and safety and (8) tolerating situations in relation to health and safety. Each skill is rated on an individually defined 4-point scale, the points on each scale are qualitatively different, however, in all skill areas 1 represents the lack of a skill, 2 the early emergence of the skill, 3 the skill during acquisition and 4 represent competency.

The development of the E8, as outlined by the authors, is described in Armstrong et al. (2021). There is no published reliability or validity data.

2.4 | Procedure

Replication study Information sheets and consent forms were given to all the teaching staff in the school and all 19 agreed to provide information to the study. Information sheets and consent forms were then sent to the parents/ carers of the 220 pupils in the school, 77 of whom chose to opt in. However, at the time of data collection, one teacher was unavailable, resulting in 74 participants.

HA (the first author) interviewed the class teachers and completed both the E8 and the PBI-S-S for all participants. Data were collected in February 2022.

Participant demographic data was abstracted from the school records in February 2022.

There was no data missing from the questionnaires.

2.4.1 | Follow-up study

Information sheets and consent forms were given to all the involved teaching staff in the school and all opted into the study. Information sheets and consent forms were then sent to the 103 parents/carers of the pupils who had participated in the original Armstrong et al. (2021) study and who were still at the school. If parents/carers did not respond to the information the school telephoned them to discuss the study further. Forty-five chose to opt in. The first author (HA) interviewed the class teachers and completed both the E8 and the PBI-S-S for each participant. This time 2 data were collected in May 2022 (time 1 data had been collected in February and March 2020).

When the data collected at this point was compared to that included in the original study it became apparent that six of the participants had been excluded from the original study because of the length of time the teacher had known the pupils, and so there was no time 1 data for them. This therefore resulted in 39 participants for whom both time 1 (from the original study) and time 2 data were available, and 45 participants for whom there was only time 2 data.

Further ethical approval was sought and gained to collect retest data. Information sheets and consent forms were given to all the involved teaching staff and all opted into the collection of retest data. Information sheets and consent forms were then sent to the parents/carers of the 45 pupils who opted into the collection of time 2 data. The school contacted parents who did not respond to the information to discuss the study further. Nineteen chose to opt into the collection of retest data.

The retest data for the E8 was collected 2 weeks after the test data, at the end of May 2022. This data was collected via video call interviews with the teachers as it was not possible to see them in person due to the location of the school and the researcher.

The demographic data related to the participants was abstracted from the school records in July 2022.

There was no data missing from the questionnaires.

2.5 | Data reduction and analysis

Information from the school was collated into the presence or absence of demographic variables—a diagnosis of autism, English as an additional language at home, and eligibility for free school meals. A pupil's month and year of birth was used to calculate their age.

The information from the BPI-S-School was coded using the definitions for challenging behaviour outlined by Nicholls et al. (2019), using these definitions to be classified as challenging SIB or ADB had to be rated as severe, or rated as moderate and occur at least once a week or rated as mild and occur daily. Similarly, to be rated as challenging STB had to occur more than once an hour. The results were then dichotomised into the presence (one or more behaviour that was rated as challenging) or absence of challenging behaviour.

To the best of our knowledge, the E8 has only been used in research once before (Armstrong et al., 2021). That study concluded

that the most sensitive way to code the data was to code each pupil as passing or failing the E8, based on the lowest individual skill level within the questionnaire. Thus, at cut-off one a pupil fails the E8 if they score 1 on any skill and passes if they score 2, 3 or 4 on all skills. At cut-off two a pupil fails the E8 if they score 1 or 2 on any skill and passes if they score 3 or 4 on all skills, similarly, for cut-off three. This method of coding the E8 was used in the replication study. In the follow-up study the individual skills within the E8 were considered in a similar manner but to enable the statistical analysis a continuous variable was required. To obtain this each E8 was classified dependent on the lowest rating for each of the individual skills within it. If the lowest rating of any of the individual skills in the E8 was a 1 the overall E8 was assigned a 1, if the lowest rating was at 2 it was assigned a 2, if the lowest rating was a 3 it was assigned a 3 and if the E8 contained only 4 s it was assigned a 4. A continuous variable made from simply summing the scores within the E8 was not possible as it obscured the detail within the scale. Pupils could have gained the same total score by scoring moderately well on all the skills, or by scoring very well on some skills and very poorly on one or two.

These data were analyzed using SPSS version 28.

In the replication study prevalence scores were determined for each of the individual types of challenging behaviour and the combinations. Prevalence was described as a percentage with 95% confidence intervals. Conditional probabilities were calculated using the overall skill level (coded pass/fail) at each cut-off point to examine the association between the pupil's overall skill level and the presence of any type of challenging behaviour. Logistic regression was used to explore the associations between having a diagnosis of autism, level of intellectual ability, gender and 'key skills' as predictor variables and challenging behaviour as the outcome. A cut-off of two on the E8 was used in the analysis.

In the follow-up study challenging behaviour and E8 data were tested for skew and kurtosis and differed from the assumptions for normality. Nonparametric tests were thus used to explore group differences. A Related Samples McNemar Test was used to explore group differences in challenging behaviour from time 1 to time 2, a Wilcoxon Signed Ranks Test was used to explore group differences in E8 scores from time 1 to time 2. As group differences can mask individual change the data was also explored at an individual level. Each pupil was assigned a number from 1 to 39 and the change in their E8 and CB scores were plotted in a 3×3 table to explore whether those whose E8 scores increased most were also most likely to show a reduction in their CB. Test/retest reliability for the E8 was examined by determining Cohen's kappa for the agreement between the teachers E8 scores for the pupils. Kappa was calculated for the agreement between the overall E8 score, classified as 1, 2, 3 or 4 as described above.

2.6 | Ethical approval

Both studies were approved by the Ulster University School of Psychology Research Ethics Committee.

3 | RESULTS

3.1 | Replication study

3.1.1 | Prevalence of challenging behaviour

When the definitions outlined in Nicholls et al. (2019) were applied to the data from the BPI-S-Schools 35.1% (95% CI [25.7%, 44.6%]) of the pupils met the criteria for having challenging behaviour. STB was the most prevalent type of challenging behaviour 21.6% (95% CI [13.5%, 31.1%]), both ADB and SIB were displayed by 13.5% (95% CI [6.8%, 20.3%]). All 3 types of behaviour were displayed by 2.7% (95% CI [0.0%, 6.8%]).

3.1.2 | Conditional probability of any type of challenging behaviour for different cut-off points on the E8

The conditional probability of having any type of challenging behaviour decreases as the E8 scores increases. The greatest probability of having any type of challenging behaviour is if the E8 scores include a score of 1 ($P(CB|Fail1) = .94$), if the E8 score only includes 2, 3 and 4 the probability falls to .16. The probability falls further to .08 if all the E8 scores are 3 or 4 and the lowest probability of having any form of challenging behaviour is if all the scores are 4 ($P(CB|Pass3) = .06$).

3.1.3 | Significance of the various predictors of challenging behaviour

Table 5 shows the independent contribution of the presence of an autism diagnosis, presence of severe learning disability and gender to the prediction of any type of challenging behaviour. The only significant independent predictor is the presence of autism. The odds of having any form of challenging behaviour if the pupil has a diagnosis of autism is 8.23 (95% CI [2.39, 28.33]). Using the Nagelkerke *R*-square estimate the model explains 31% of the variance in challenging behaviour.

Table 6 shows the independent contribution of the same predictors and, in addition, a difficulty in 'key skills' (using the E8 at cut-off 2) to the prediction of any type of challenging behaviour. Significant independent predictors were the E8 score and the presence of an autism diagnosis. The odds of having challenging behaviour if a pupil failed the E8 at a cut-off point of 2 is 318.43 (95% CI [18.15, 5586.31]). The odds of having any form of challenging behaviour if the pupil has a diagnosis of autism is 16.64 (95% CI [1.39, 199.41]). Using the Nagelkerke *R*-square estimate the model explains 78.5% of the variance in challenging behaviour.

TABLE 5 Logistic regression analysis for any type of challenging behaviour, excluding E8 scores.

Variable	Sig.	Odds ratio	95% CI
Presence of autism	<0.001	8.23*	(2.39, 28.33)
Presence of severe learning disability	0.181	3.53	(0.56, 22.44)
Male gender	0.399	1.71	(0.49, 5.92)

Note: Cox and Snell *R*-square .225, Nagelkerke *R*-square .310.
*Significant at 0.05 level.

TABLE 6 Logistic regression analysis for any type of challenging behaviour, including E8 scores.

Variable	Sig.	Odds ratio	95% CI
Presence of autism	0.026	16.64*	(1.39, 199.41)
Presence of severe learning disability	0.265	0.15	(0.01, 4.12)
Male gender	0.994	1.01	(0.12, 8.31)
Deficit in 'key skills' (E8 cut-off 2)	<0.001	318.43*	(18.15, 5586.31)

Note: Cox and Snell *R*-square .571, Nagelkerke *R*-square .785.
*Significant at 0.05 level.

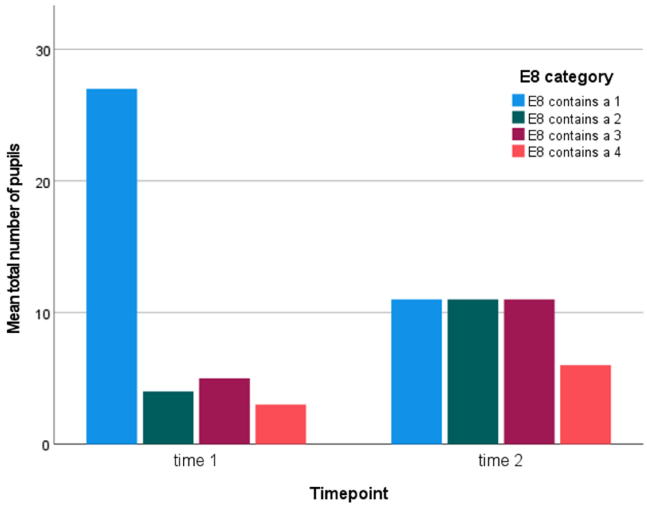

FIGURE 1 Total number of pupils in the different E8 categories at times 1 and 2.

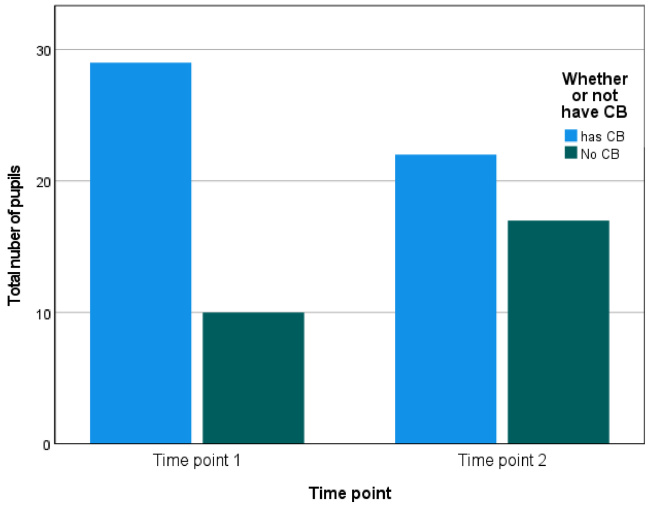

FIGURE 2 Total number of pupils who had, and did not have, challenging behaviour at times 1 and 2.

3.1.4 | Follow-up study

Group differences from time 1 to time 2 in E8 scores

At time 1 69.2% of the pupils had an overall level of 1 on the E8, 10.3% had an overall level of 2, 12.8% an overall level of 3 and 7.7% an overall level of 4. At time 2 28.2% had an overall level of 1, 28.2% an overall level of 2, 28.2% an overall level of 3 and 15.4% an overall level of 4. These scores are shown in Figure 1 below.

The Wilcoxon Signed Ranks Test results in a Z score of −4.054 ($p < .001$) and shows a significant difference in E8 scores between time 1 and time 2.

Group differences from time 1 to time 2 in whether pupils had challenging behaviour

At time 1 74.4% of the pupils had challenging behaviour and 25.6% did not. At time 2 56.4% of the pupils had challenging behaviour and 43.6% did not. The change in challenging behaviour scores is shown in Figure 2 below.

The Related Samples McNemar Test results in a test statistic of 4.000 ($p = .046$) and shows a significant difference in the level of CB between time 1 and time 2.

3.2 | Individual changes from time 1 to time 2

The tables below show the change in challenging behaviour status and E8 score for each pupil from time 1 to time 2. Table 3 shows the changes for pupils who had challenging behaviour at time 1 and Table 4 shows the changes for pupils who did not have challenging behaviour at time 1 (Table 7).

Most pupils who had challenging behaviour at time 1 showed an increase in their E8 category from time 1 to time 2. The pupils for whom an increase in E8 category resulted in them not having

TABLE 7 Change in challenging behaviour status and E8 score for each pupil who had challenging behaviour at time 1.

	Decrease in challenging behaviour from time 1 to time 2	No change in challenging behaviour from time 1 to time 2		Increase in challenging behaviour from time 1 to time 2
Increase in E8 category from time 1 to time 2	3 (3, 4)	1 (1, 2)	23 (1, 2)	
	7 (1, 3)	4 (1, 3)	24 (1, 3)	
	15 (1, 3)	6 (1, 2)	25 (1, 2)	
	18 (1, 2)	11 (1, 2)	28 (1, 2)	
	20 (2, 3)	13 (1, 3)	30 (1, 2)	
	32 (1, 2)	19 (1, 2)	34 (1, 3)	
	Average final E8 category = 2.83		**Average final E8 category = 2.33**	
No change in E8 category from time 1 to time 2	5 (1, 1)	2 (1, 1)	31 (1, 1)	
	14 (1, 1)	8 (1, 1)	33 (1, 1)	
		9 (1, 1)	35 (1, 1)	
		16 (1, 1)	38 (1, 1)	
		21 (1, 1)		
Decrease in E8 category from time 1 to time 2				

Note: Pupil number (E8 category time 1, time 2).

TABLE 8 Change in challenging behaviour status and E8 score for each pupil who did not have challenging behaviour at time 1.

	Decrease in challenging behaviour from time 1 to time 2	No change in challenging behaviour from time 1 to time 2		Increase in challenging behaviour from time 1 to time 2
Increase in E8 category from time 1 to time 2		12 (3, 4)	27 (2, 4)	17 (2, 3)
		26 (3, 4)	29 (3, 4)	
No change in E8 category from time 1 to time 2		10 (3, 3)	39 (4, 4)	
		22 (2, 2)		
Decrease in E8 category from time 1 to time 2		36 (4, 3)		
		37 (4, 3)		

Note: Pupil number (E8 category time 1, time 2).

challenging behaviour at time 2 had an average final E8 category of 2.83. The pupils whose E8 increased but who also continued to have challenging behaviour had a final E8 category of 2.33.

Two pupils' results (5, 14) do not fit the hypothesis as there was no change in their E8 score but a reduction in their challenging behaviour (Table 8).

Most of the pupils who did not have challenging behaviour at time 1 continued not to have challenging behaviour at time 2 and had E8 categories of 3 or 4.

One pupil (17) does not fit the hypothesis as their E8 category increased from 2 to 3 but they developed challenging behaviour.

3.2.1 | Test–retest reliability of the E8

Cohen's kappa for the agreement between the teachers' ratings of the E8 at test and retest is .69 ($p < .001$). This level of agreement is classified as a good agreement using Altman's (1991) classification.

4 | DISCUSSION

The aim of both of these studies was to replicate and extend the previous study by Armstrong et al. (2021) focusing on the role of a group of 'key skills' as an important, and possibly preventable, risk marker for challenging behaviour.

The replication study includes pupils with a wider age range (5–17 years rather than 5–11 years in the previous study), fewer pupils with a diagnosis of autism (54.1% vs. 88%) and pupils with a different cultural background (none of the pupils have English as an additional language at home compared to almost 57%) than the original study. In addition, the pupils had a lower prevalence of challenging behaviour (35.1% vs. 66%). Nevertheless, our findings are similar. We found that pupils with the lowest skill level on the E8 (a score of 1 on at least one skill) were most likely to have challenging behaviour (94%), while those with the highest scores (a score of 4 on all the skills) were least likely (6%). Armstrong et al. (2021) found these were 93% and 13%, respectively. This adds additional support to the hypothesis that the

lack of these 'key skills' may be an important risk marker for the development of challenging behaviour.

The replication study also extends the Armstrong et al. (2021) study by exploring the significance of 'key skills' in relation to other well-studied risk markers for challenging behaviour. The results show that when the presence of an autism diagnosis, level of intellectual disability and gender are entered as predictors of challenging behaviour the only significant predictor is a diagnosis of autism with an eightfold increase in risk of challenging behaviour. This finding is in line with much of the risk marker literature which highlights a diagnosis of autism as a significant risk factor for challenging behaviour (e.g., Esteves et al., 2021; Nicholls et al., 2019). When 'key skill' level is added into the model, 'key skill' difficulties and an autism diagnosis are strongly associated with challenging behaviour and explain more of the variance in challenging behaviour (78.5%). The results suggest that 'key skills' difficulties are of greater importance than an autism diagnosis, more severe intellectual disabilities or being male in predicting the likelihood of a child or young person with an intellectual disability having challenging behaviour.

The follow-up study extends the Armstrong et al. (2021) study by gathering follow-up data from the young people included in the original study, to look at the impact of skills building on the young people's levels of challenging behaviour. The sample included in the follow-up study was similar to the original study as the majority of pupils were male, have a diagnosis of autism in addition to an intellectual disability and had English as an additional language at home. The results from the follow-up study show that during the two-year period there was a significant increase in the pupils' E8 skill level, and also a significant decrease in their level of challenging behaviour at school.

Considering the results at an individual rather than a group level also provides information on the role of 'key skills' in challenging behaviour. The results for every individual pupil (with the exception of only three) support the original hypothesis. For those who had challenging behaviour at the time of the initial study, if their E8 category increased at follow-up their challenging behaviour either stayed the same or decreased. It is also notable that those whose challenging behaviour decreased had a higher final average E8 category than those whose challenging behaviour remained the same, suggesting that pupils who have higher skill levels are less likely to have challenging behaviour. Some pupils showed no change in E8 category or challenging behaviour levels. Of those pupils who did not have challenging behaviour in the initial study all but one continued not to have challenging behaviour in this follow-up study. Most of the pupils who did not have challenging behaviour had E8 scores of 3 or 4 indicating that they have a higher skill level and are reaching competency in the 'key skills'.

Three of the pupils did not follow the predicted hypothesis. Two of the pupils had challenging behaviour at the time of the initial study but although their E8 skills stayed the same at follow-up, their challenging behaviour decreased (pupils 5 and 14). Closer consideration of their results indicates that both pupils have behaviour that is difficult, however it is not behaviour that is included in the BPI-S-S—one was 'crying' and the other 'crying/screaming' and 'refusing to leave'. Without further details, it is impossible to know whether this behaviour would meet the criteria for challenging behaviour. The third pupil—pupil 17—did not have challenging behaviour during the original study but at the follow up study had an increase in their E8 category and an increase in challenging behaviour. A possible explanation for this result is that although pupil's overall E8 level increased, their making requests skill decreased, and this impacted on their behaviour as the challenging behaviour that was noted was grabbing items from others. However, this is speculative.

Taken together the results from these two studies add further weight to the suggestion by Armstrong et al. (2021) that a child's lack of 'key skills' (as defined by the E8) is an important risk marker for the development of challenging behaviour. Drawing on the Oliver (1993) model, a lack of 'key skills' could be seen as mediating factors which stem from biological and psychosocial vulnerabilities (such as a child having a diagnosis of autism or a more severe intellectual disability) and interact with the environment to lead to challenging behaviour. Further research is needed to explore whether there is a mediator relationship. Some risk markers can be transitory (such as pain or mental health difficulties) and it would be expected that, when present, such factors would lower a young person's 'key skill' level and so increase the likelihood of them displaying challenging behaviour. This is an interesting suggestion as 'key skills' differ from many biological and psychosocial vulnerabilities as they can be taught and developed, and the indications from the follow-up study are that if 'key skills' are identified and developed, this can result in a decrease in, or absence of, challenging behaviour. This therefore suggests that routinely assessing, and monitoring, 'key skills', and focusing on developing these skills both within schools and in the child's community context, rather than only addressing challenging behaviour when it occurs, can have a role in helping to reduce or prevent challenging behaviour occurring. The school involved in this study includes developing 'key skills' as an integral part of all of its curricula and focuses on supporting pupils to develop these skills.

It is important to note that the results of the follow-up study also suggest that some children find it easier to develop 'key skills' than others. The Oliver (1993) model suggests that challenging behaviour may result when the demands of the situation exceed a child's skill level to manage, and hence challenging behaviour can be prevented either by a child's skill level increasing or by altering the environment so that the demands are reduced. For example, a child can be taught to request an apple or apples can be continually available for them to access themselves, equally a child can be taught ways to manage transitions or transitions can be avoided. The impact of these different approaches may be different. Teaching a child, a skill may enable them to access more environments and may help to increase their quality of life, whereas if an adjusted environment is required the number of situations that the child is able to manage may decrease and this may impact their quality of life. However, the model suggests that both approaches may be effective in decreasing challenging behaviour.

These studies also address a noted weakness of the Armstrong et al. (2021) study regarding the lack of psychometric data for the E8.

This study considered the test/ retest reliability of the E8 at the different cut-off points.

5 | LIMITATIONS

The number of pupils included in the follow-up study was small, as was the age range of pupils included because it was a follow-up study and only included pupils who are still at the school. Therefore, future studies, with greater numbers, are needed to explore this issue further. In addition, the follow-up study did not contain a control group and so causality cannot be assumed.

Both studies used questionnaires to measure both 'key skills' and challenging behaviour which means that the data is based on teachers' assessment of pupils' skills and challenging behaviour. However, we tried to address this concern by ensuring that the pupils were well-known to the teachers who completed the questionnaires. Both studies were conducted with children and adolescents within a specific age range and cannot be generalised to other populations.

Arguably the inclusion of stereotypy within the definition of challenging behaviour is problematic as not all stereotypy meets the definition of challenging behaviour (Gore et al., 2022), it was included in these studies to ensure that they were comparable to the original Armstrong et al. (2021) study.

A further limitation is the limited reliability and validity data related to the E8. This study reported test/retest data for the follow-up study, future studies could collect further data regarding both test/retest and inter-rater reliability. Given the previously reported correlation between emotion regulation skills and challenging behaviour (Maddox et al., 2018) future studies could look at the association between emotion regulation measures and the E8.

6 | IMPLICATIONS FOR PRACTICE

The combined results of these studies present important and original findings, which have promising implications for practice. For professionals who are involved in education and provision for children with intellectual disability, the knowledge that 'key skills' difficulties, as measured by the E8, may be a useful risk marker for the development of challenging behaviour is important. A strategy of early skills building, focusing on those skills, both in school and in the community, appears to be an important element in preventing challenging behaviour occurring in the first place- irrespective of gender, age and diagnosis. Additionally it is worth noting that following the initial assessments, school staff were entirely responsible for teaching the key skills, without additional external support from the authors. The ability to assess and address key skills using tools such as the E8 is a promising addition to educators skill set.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

Ala'i-Rosales, S., Cihon, J. H., Currier, T. D. R., Ferguson, J. L., Leaf, J. B., Leaf, R., McEachin, J., & Weinkauf, S. M. (2018). The big four: Functional assessment research informs preventative behavior analysis. *Behavior Analysis in Practice*, *12*(1), 222–234. https://doi.org/10.1007/s40617-018-00291-9

Allen, D., Langthorne, P., Tonge, B., Emerson, E., McGill, P., Fletcher, R., Dosen, A., & Kennedy, C. (2013). Towards the prevention of Behavioural and psychiatric disorders in people with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*, *26*(6), 501–514. https://doi.org/10.1111/jar.12050

Altman, D. G. (1991). *Practical statistics for medical research*. Chapman & Hall.

Armstrong, H., Denne, L. D., & Bailey, T. (2021). 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. *International Journal of Positive Behavioural Support*, *11*(2), 3–14.

Bowring, D. L., Painter, J., & Hastings, R. P. (2019). Prevalence of challenging behaviour in adults with intellectual disabilities, correlates, and association with mental health. *Current Developmental Disorders Reports*, *6*(4), 173–181. https://doi.org/10.1007/s40474-019-00175-9

Bowring, D. L., Totsika, V., Hastings, R. P., Toogood, S., & Griffith, G. M. (2017). Challenging behaviours in adults with an intellectual disability: A total population study and exploration of risk indices. *British Journal of Clinical Psychology*, *56*(1), 16–32. https://doi.org/10.1111/bjc.12118

Chadwick, O., Kusel, Y., & Cuddy, M. (2008). Factors associated with the risk of behaviour problems in adolescents with severe intellectual disabilities. *Journal of Intellectual Disability Research*, *52*(10), 864–876. https://doi.org/10.1111/j.1365-2788.2008.01102.x

Dworschak, W., Ratz, C., & Wagner, M. (2016). Prevalence and putative risk markers of challenging behavior in students with intellectual disabilities. *Research in Developmental Disabilities*, *58*, 94–103. https://doi.org/10.1016/j.ridd.2016.08.006

Emerson, E., & Einfeld, S. (2010). Emotional and behavioural difficulties in young children with and without developmental delay: A bi-national perspective. *Journal of Child Psychology and Psychiatry*, *51*(5), 583–593. https://doi.org/10.1111/j.1469-7610.2009.02179.x

Esteves, J., Perry, A., Spiegel, R., & Weiss, J. A. (2021). Occurrence and predictors of challenging behavior in youth with intellectual disability with or without autism. *Journal of Mental Health Research in Intellectual Disabilities*, *14*(2), 189–201. https://doi.org/10.1080/19315864.2021.1874577

Fahmie, T. A., & Luczynski, K. C. (2018). Preschool life skills: Recent advancements and future directions. *Journal of Applied Behavior Analysis*, *51*(1), 183–188. https://doi.org/10.1002/jaba.434

Falligant, J. M., & Pence, S. T. (2017). Preschool life skills using the response to intervention model with preschoolers with developmental disabilities. *Behavior Analysis*, *17*(3), 217–236. https://doi.org/10.1037/bar0000056

Gore, N., Hastings, R. P., & Brady, S. R. L. (2014). Early intervention for children with learning disabilities: Making use of what we know. *Tizard Learning Disability Review*, *19*(4), 181–189. https://doi.org/10.1108/TLDR-08-2013-0037

Gore, N. J., Sapiets, S. J., Denne, L. D., Hastings, R. P., Toogood, S., MacDonald, A., Baker, P., Allen, D., Apanasionok, M. M., Austin, D., & Bowring, D. L. (2022). Positive behavioural support in the UK: A state of the nation report. *International Journal of Positive Behavioural Support*, *12*(1), i-46.

Hanley, G. P., Heal, N. A., Tiger, J. H., & Ingvarsson, E. T. (2007). Evaluation of a classwide teaching program for developing preschool life skills. *Journal of Applied Behavior Analysis*, *40*(2), 277–300. https://doi.org/10.1901/jaba.2007.57-06

Hastings, R., Allen, D., Baker, P., Gore, N., Hughes, J. C., McGill, P., Noone, S., & Toogood, S. (2013). A conceptual framework for understanding why challenging behaviours occur in people with developmental disabilities. *International Journal of Positive Behavioural Support*, *3*(2), 5–13.

Lang, R., Sigafoos, J., van der Meer, L., O'Reilly, M. F., Lancioni, G. E., & Didden, R. (2013). Early signs and early behavioral intervention of challenging behavior. *International Review of Research in Developmental Disabilities*, *44*, 1–35.

Luczynski, K. C., & Hanley, G. P. (2013). Prevention of problem behavior by teaching functional communication and self-control skills to preschoolers. *Journal of Applied Behavior Analysis*, *46*(2), 355–368. https://doi.org/10.1002/jaba.44

Maddox, B. B., Cleary, P., Kuschner, E. S., Miller, J. S., Armour, A. C., Guy, L., Kenworthy, L., Schultz, R. T., & Yerys, B. E. (2018). Lagging skills contribute to challenging behaviors in children with autism spectrum disorder without intellectual disability. *Autism*, *22*(8), 898–906. https://doi.org/10.1177/1362361317712651

McClintock, K., Hall, S., & Oliver, C. (2003). Risk markers associated with challenging behaviours in people with intellectual disabilities: A meta-analytic study. *Journal of Intellectual Disability Research*, *47*, 405–416. https://doi.org/10.1046/j.1365-2788.2003.00517.x

McGreevy, P., Fry, T., & Cornwall, C. (2012). *Essential for living: A communication, behavior and functional skills curriculum*. Assessment and Professional Practitioner's Handbook, Patrick McGreevy.

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*(3), 1215–1222. https://doi.org/10.1016/j.rasd.2011.01.009

Melville, C. A., Johnson, P. C. D., Smiley, E., Simpson, N., Purves, D., McConnachie, A., & Cooper, S.-A. (2016). Problem behaviours and symptom dimensions of psychiatric disorders in adults with intellectual disabilities: An exploratory and confirmatory factor analysis. *Research in Developmental Disabilities*, *55*, 1–13. https://doi.org/10.1016/j.ridd.2016.03.007

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 Disorder*, *3*, 474–482. https://doi.org/10.1016/j.rasd.2008.09.008

Nicholls, G., Hastings, R. P., & Grindle, C. (2019). Prevalence and correlates of challenging behaviour in children and young people in a special school setting. *European Journal of Special Needs Education*, *35*, 40–54. https://doi.org/10.1080/08856257.2019.1607659

Oliver, C. (Ed.). (1993). *Self-injurious behaviour: From response to strategy*. BILD Publications.

Petrenko, C. L. M. (2013). A review of intervention programs to prevent and treat behavioral problems in young children with developmental disabilities. *Journal of Developmental and Physical Disabilities*, *25*(6), 651–679. https://doi.org/10.1007/s10882-013-9336-2

Robison, M. A., Mann, T. B., & Ingvarsson, E. T. (2020). Life skills instruction for children with developmental disabilities. *Journal of Applied Behavior Analysis*, *53*(1), 431–448. https://doi.org/10.1002/jaba.602

Rojahn, J., Rowe, E. W., Sharber, A. C., Hastings, R., Matson, J. L., Didden, R., Kroes, D. B. H., & Dumont, E. L. M. (2012a). The behavior problems inventory-short form for individuals with intellectual disabilities: Part I: Development and provisional clinical reference data. *Journal of Intellectual Disability Research*, *56*(5), 527–545. https://doi.org/10.1111/j.1365-2788.2011.01507.x

Rojahn, J., Rowe, E. W., Sharber, A. C., Hastings, R., Matson, J. L., Didden, R., Kroes, D. B. H., & Dumont, E. L. M. (2012b). The behavior problems inventory-short form for individuals with intellectual disabilities: Part II: Reliability and validity. *Journal of Intellectual Disability Research*, *56*(5), 546–565. https://doi.org/10.1111/j.1365-2788.2011.01506.x

Sappock, T., Budczies, J., Dziobek, I., Bölte, S., Dosen, A., & Diefenbacher, A. (2014). The missing link: Delayed emotional development predicts challenging behavior in adults with intellectual disability. *Journal of Autism and Developmental Disorders*, *44*, 786–800. https://doi.org/10.1007/s10803-013-1933-5

Sigafoos, J. (2000). Communication development and aberrant behavior in children with developmental disabilities. *Education and Training in Mental Retardation and Developmental Disabilities*, *35*(2), 168–176.

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