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ORIGINAL ARTICLE

Participation-related constructs and participation of children with additional support needs in schools

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Abstract

Aim: To investigate associations between participation-related constructs and participation frequency and involvement in inclusive schools.

Method: In this cross-sectional study, teachers of children with additional support needs, including intellectual disability, autism, and learning difficulties, completed measures. Participation-related constructs were measured using the School Participation Questionnaire; participation frequency and involvement were measured using the Participation and Environment Measure for Children and Youth. A series of multilevel linear mixed-effects regression models with maximum likelihood estimates and bootstrap confidence intervals with *p*-values were obtained. Final models included participation-related constructs and participation, controlling for demographic and diagnostic confounders (including age, sex, language, level of school support, and autism).

Results: Six hundred and eighty-eight children (448 [65.1%] males; mean age 8 years 7 months [range 4 years 10 months–12 years 13 months, standard deviation 2 years 1 months]) were assessed by 252 teachers. Across a series of models, participation-related constructs were consistently associated with more intensive participation (competence, environment, identity $p < 0.001$; symptoms $p = 0.007$), independent of confounders. More frequent participation remained associated with three of four participation-related constructs (competence, identity $p < 0.001$; environment $p = 0.021$). Age ($p = 0.046$), language ($p = 0.002$), and level of school support ($p = 0.039$) also remained significantly associated with frequency of participation.

Interpretation: Children with additional support needs in inclusive schools may have several participation barriers. Policies and interventions to improve participation are needed.

Abbreviations: PEM-CY, Participation and Environment Measure for Children and Youth; SPQ, School Participation Questionnaire.

*Additional members of the SPQ study group are listed in the Acknowledgements.

Children with additional support needs, disabilities, and/or chronic conditions are at risk for participation restrictions. The World Health Organization's International Classification of Functioning, Disability, and Health defines participation as 'involvement in a life situation',[1] alongside 'body functions and structures', and 'activities'. These exist in dynamic interaction with 'health conditions' (disease/symptoms) and 'personal and environmental factors'. Participation itself has two important elements: attendance (presence, frequency, or amount) and involvement (experience, intensity, or engagement).[2,3] Factors that influence participation have been termed participation-related constructs.[2,3] These include environment (e.g. physical and social structures) and within-person factors (e.g. interests, preferences, sense of self).[2,3] Environments provide (or do not provide) spaces, objects, relationships, activities, and opportunities[4] which influence choices, behaviours, and feelings around participation. No single aspect controls participation outcomes[5] and participation research should consider the simultaneous contributions of these interrelated factors.[6] Within-person processes interact with environments[2,3] and there may be differential influences of personal versus environmental determinants on different facets of participation.[7] Environment and within-person factors should therefore always be considered together.[2–7]

Previous research has clustered around leisure or community participation in clinical samples. Yet children spend significant time in school, and a focus on participation here provides insights into needs and supports.[8] Children with additional support needs can experience participation restrictions.[9–14] However, it remains difficult to know the prevalence of restrictions because of a lack of representative research with contemporary measures.[15] Often, research is completed on the basis of parent or clinician reports, whereas teachers are seldom involved. This does not reflect the contemporary shift from individual 'health' interventions towards collaboration with educators.[16–18]

This study aimed to investigate school participation (hereafter referred to as participation) using teacher report. We focus on participation in typical activities: classroom activities, field trips and school events, teams, clubs and organizations, getting together with peers, and special roles. Multilevel linear mixed-effects regression models were used. We expected, on the basis of our previous research,[5–7] that participation would be associated with participation-related constructs (identity, competence, symptoms, and environment) while controlling for a range of confounding variables.

What this paper adds

- Across a series of models, participation-related constructs were associated with frequency and intensity of participation.
- Only participation-related constructs were associated with participation intensity.
- Demographic and diagnostic variables were associated with frequency, not intensity, of participation.
- Teacher assessment is valid for assessment of participation and participation-related constructs.

METHOD

Context and sampling

This study was conducted in primary schools randomly sampled in an urban area of Scotland (details in Appendices S1 and S2). To avoid overlapping samples, we excluded schools included in our previous studies.[6,7] Twenty-two schools were recruited, each providing 25 to 35 children. Such targets had previously been identified as feasible.[6,7] In Scotland, children begin primary school at 4 years 6 months to 5 years 6 months, attending for 7 years before starting secondary education at 11 years 6 months to 12 years 6 months. Schooling is inclusive, with most children attending general schools and a minority attending 'special' schools; inclusive practices led by teachers are therefore commonplace.[19]

Inclusion

Eligible children were in inclusive primary schools and had a need as reflected in national census records:[19] learning disability; dyslexia; other specific learning difficulty (e.g. numeric); other moderate learning difficulty; visual impairment; hearing impairment; deafblind; physical or motor impairment; language or speech disorder; autism spectrum disorder; social, emotional, and behavioural difficulty; physical health problem; or mental health problem.[19] Children could have multiple conditions/needs. The school leadership team identified children who met inclusion criteria and selected participants using a lottery (aiming to provide equal proportions across each of the seven school years/grades). Sample representativeness was explored through checks against a population census.[19] On review, the final sample demonstrated acceptable representativeness compared with census records (Appendix S3).

Ethics

Queen Margaret University Ethics Committee and the City of Edinburgh Local Authority (local government) Research Access Committee provided approval. Each school's head teacher provided written informed consent. Participating teachers provided informed consent. Participation was voluntary and schools and teachers were given the opportunity to opt out at any time. Parental consent was not sought, as teachers completed measures based on professional

knowledge and school-held records. Children were not directly involved and data were anonymized before release.

Measures

Participation and Environment Measure for Children and Youth

Participation was assessed using the Participation and Environment Measure for Children and Youth (PEM-CY).[20] The PEM-CY is based on a contemporary model of participation and has moderate to good reliability and validity.[20] Frequency and involvement scores from the school module were used. Respondents scored participation frequency (from 0 'never' to 7 'daily') and involvement (from 1 'minimally' to 5 'very involved'). Frequency was calculated as the average of ratings. This calculation can be inclusive of the items that are scored 'never' (0).[20] Involvement was calculated as the average of all ratings except those marked 'never'.

School Participation Questionnaire

Participation-related constructs were measured by the School Participation Questionnaire (SPQ), a 44-item teacher-report measure[21] (items in Appendix S4). The SPQ draws on a novel conceptual framework of participation determinants in the school setting.[5–7] The questionnaire comprises four scales. The 'environment' scale (19 items) measures the physical (spaces, objects) and social (peers, teachers, routines) environment of the school. The 'identity' or 'being' scale (nine items) assesses the child's thoughts, feelings, knowledge, preferences, self-perceptions, and role perceptions as evidenced through observed behaviours and actions. The 'competence' or 'doing' scale (11 items) assesses choices, persistence, meeting expectations, performing roles, and skills. The 'experience of mind and body' or 'symptoms' scale (five items) assesses the extent to which the child has displayed any of the following symptoms: lack of energy, tiredness/sleepiness, pain, low mood, and anxiety. Across each scale, all items are rated on a 4-point Likert scale (from 1 'disagree' to 4 'agree'). Observations are recalled for the previous 2 weeks. Higher scores represent a more facilitative school environment (environment scale), favourable child characteristics (identity scale, competence scale), and fewer symptoms (symptoms scale). Psychometric properties (Cronbach's alpha, test–retest, and interrater reliability, unidimensionality) have previously been confirmed.[6,7]

Confounders

We controlled for factors that might affect observed relationships: age (months); sex (male/female); English as an additional language (yes/no); autism (yes/no); level of school support (three levels, with level III representing most intensive support); and looked-after status (yes/no) (government terminology for children in state care). We selected autism as these children were more likely to have participation restrictions[9,10] allowing us to test the relative importance of participation-related constructs alongside a known determinant.

Statistics

Bivariate analysis (Spearman's rank correlation) was initially used to explore the association between SPQ scores (participation-related constructs) and PEM-CY scores (participation), as well as the association of age with PEM-CY and SPQ scores. A Wilcoxon rank-sum test with continuity correction was used to measure the association of the following demographic variables with both the PEM-CY and SPQ: sex, looked after, language, and autism. A Kruskal–Wallis test was used to measure associations between school support level with PEM-CY and SPQ. Correlation coefficients (ρ) and effect size with p-values were obtained.

Regression models examined how participation-related constructs affected participation. Our rationale was that the SPQ measures factors that influence participation. Hence participation was the dependant variable, while SPQ scales were independent variables, with other independent variables treated as confounders. Outcomes were observed for children (level 1 units) within schools (level 2 units) leading to non-independent data. A class of multilevel linear mixed-effects regression models[22] taking into account the hierarchical nature of the data were fitted, wherein t-tests using Satterthwaite approximation were used for the fixed effects and likelihood ratio tests for the random effects. Maximum likelihood estimates and bootstrap confidence intervals with p-values were obtained.[23] The fixed effects part of the model illustrated the impact of independent variables (e.g. participation-related constructs, demographics) on the outcome (e.g. participation intensity), whereas the random effects part included the grouping factor 'school', and allowed for a random intercept for each school to control for the variation between children across schools. Throughout, separate models were run for participation frequency and involvement, as the literature indicates they are distinct. For each outcome, three sets of models were built. Model A included only participation-related constructs. Model B investigated confounding variables. Model C examined all variables, exploring associations between participation-related constructs and outcome while adjusting for confounders. Multicollinearity was detected in models including both SPQ identity and SPQ competence scales (Spearman's ρ = 0.84; variance inflation factor >3). Therefore, separate models were run including each scale.

Model robustness was determined through verifying the assumptions of linearity, normality, and homoscedasticity, and through the random effects block bootstrap technique.[24] Missing data were less than 10% (5.2%), and complete case analysis was conducted. Statistical tests

TABLE 1 Demographics of children (n = 688)

	Mean (SD, range)	Median (IQR)
Age, y:mo	8:7 (2:1, 4:10–12:3)	8:7 (3:7)
Children	*n*	%
Sex		
Female	236	34.30
Male	448	65.12
Missing	4	0.58
Ethnicity		
White	575	83.58
African	11	1.60
Asian	43	6.25
Caribbean	1	0.15
Mixed/multiple/other/not disclosed/not known	37	5.38
Missing	21	3.05
Primary language		
English	591	85.90
Other	80	11.63
Missing	17	2.47
Need classifications[a]		
Autism	159	23.11
Communication support need	87	12.65
Deafblind	0	0.00
Dyslexia	108	15.70
Hearing impairment	21	3.05
Language or speech disorder	81	11.77
Learning disability	94	13.66
Mental health problem	27	3.92
Other moderate learning difficulty	88	12.79
Other specific learning difficulty (e.g. numeric)	60	8.72
Physical health problem	77	11.19
Physical impairment	60	8.72
Social emotional and behavioural difficulty	236	34.30
Visual impairment	33	4.80
Missing	48	6.98
Support level in school[b]		
I	209	30.38
II	238	34.59
III	241	35.03
Looked-after child[c]		
Yes	38	5.52
No	636	92.44
Don't know	6	0.87
Missing	8	1.16

[a]Children may be in multiple categories. Individual categories may not sum to 100%. 'Learning disability' matches the definition 'intellectual disability'. Moderate and specific learning difficulties are umbrella terms for often co-occurring difficulties (dyslexia, dyspraxia, dyscalculia, attention-deficit/hyperactivity disorder). A child may be diagnosed with a learning difficulty where there is a lack of achievement for age/ability, or a discrepancy between achievement and ability. Dyslexia is recorded separately owing to national practice, and impact on education. 'Communication support need' represents children who experience difficulties communicating and/or understanding others and is used in place of a more specific diagnosis.

[b] Level I: child's needs are managed by the class teacher; level II: child's needs are managed with help from specialist or more senior teachers within the school; level III: child's needs are managed with support from partnership services or agencies (e.g. therapists or psychologists).

[c] This is the official terminology used by Scotland's national and local government bodies to describe children and young people who are in the care of a local authority/local government.

Abbreviations: IQR, interquartile range; SD, standard deviation.

were conducted at the 5% level of significance. SPQ ratings for each subscale were transformed to Rasch measures (Appendix S5). Analyses were conducted in R (R Foundation, Vienna, Austria).

Model validity

Models satisfied the assumptions of linearity, homoscedasticity, and normality for fixed and random effects (Appendices S6 and S7). The residual plot did not indicate deviations from a linear form, its variance was constant and did not depend on the fitted values, and both the residuals and random intercepts followed a normal distribution. A non-significant result was found for the Shapiro–Wilk normality test. The random effects block bootstrapping technique showed negligible bias for parameter estimates, wherein the observed values of regression coefficients from the models were very close to the average value of the same obtained from 1000 replicates (Appendices S6 and S7).

RESULTS

Two hundred and fifty-two teachers from 22 schools administered measures for 688 children. Common needs included autism (159 out of 688 [23.11%]), language or speech disorder (81 out of 688 [11.77%]), learning disability (94 out of 688 [13.66%]), and dyslexia (108 out of 688 [15.70%]) (Table 1).

Bivariate analysis

Most confounders were significantly but weakly associated with participation frequency and involvement.

TABLE 2 Means, standard deviations, and correlation analyses of PEM-CY and demographic variables (n = 641–684)

		Participation frequency			Participation involvement	
	Mean (SD)	Median (IQR)	ES (p)	Mean (SD)	Median (IQR)	ES (p)
Sex						
Male	4.2 (1.2)	4.2 (3.4–5.2)	0.10 (0.008**)	3.4 (1.0)	3.5 (2.8–4.2)	0.11 (0.003**)
Female	4.4 (1.2)	4.5 (3.7–5.3)		3.7 (1.0)	3.7 (3.0–4.4)	
Looked after						
No	4.3 (1.2)	4.4 (3.6–5.2)	0.04 (0.262)	3.5 (1.0)	3.7 (3.0–4.2)	0.06 (0.126)
Yes	4.0 (1.4)	4.2 (3.2–5.2)		3.3 (0.9)	3.5 (2.7–3.9)	
Language						
English	4.3 (1.2)	4.4 (3.6–5.2)	0.05 (0.186)	3.5 (1.0)	3.6 (3.0–4.2)	0.02 (0.613)
Non-English	4.1 (1.4)	4.2 (3.2–5.0)		3.6 (1.0)	3.6 (3.0–4.3)	
Autism						
Yes	4.0 (1.4)	4.0 (3.2–5.0)	0.12 (0.001**)	3.2 (1.1)	3.4 (2.6–4.0)	0.14 (<0.001***)
No	4.4 (1.1)	4.4 (3.6–5.2)		3.6 (1.0)	3.7 (3.0–4.2)	
Support level						
I	4.3 (1.2)	4.4 (3.6–5.2)	0.02 (0.001**)	3.6 (1.0)	3.7 (3.0–4.2)	0.02 (0.001**)
II	4.5 (1.1)	4.6 (3.8–5.2)		3.6 (1.0)	3.6 (3.0–4.4)	
III	4.0 (1.4)	4.0 (3.2–5.0)		3.3 (1.0)	3.5 (2.6–4.0)	
			ρ (p)			ρ (p)
Age			0.13 (<0.001***)			0.11 (0.006**)

ES (p) denotes the magnitude of effect size and corresponding p-value.

Wilcoxon rank-sum test with continuity correction was used to measure the association of demographic variables sex, looked after, language, and autism with PEM-CY. A Kruskal–Wallis test was used to measure the association of support level with PEM-CY. ρ denotes Spearman's ρ, which was used to measure the association between age and PEM-CY.

Respondents scored PEM-CY participation frequency (from 0 'never' to 7 'daily') and involvement (from 1 'minimally' involved to 5 'very involved).

*p < 0.05, **p < 0.01, ***p < 0.001.

Abbreviations: IQR, interquartile range; PEM-CY, Participation and Environment Measure for Children and Youth; SD, standard deviation.

Significantly higher participation frequency and involvement was observed for females (vs males); non-autistic children (vs autistic); across school support levels I, II, and III; and for age (Table 2). Participation frequency and involvement had moderate to strong significant positive relationships with all participation-related constructs, except for a weaker association between symptoms and frequency (Appendix S8).

All participation-related constructs (identity, competence, environment, and symptoms) were significantly but weakly associated with autism and with school support level, with higher scores observed for non-autistic children (vs autistic children) and school support levels I, II, and III. Identity, competence, and symptom scores were significantly higher in females. Identity and competence scores also significantly increased with age. Symptoms were significantly associated with looked-after status, with better scores for those not looked after. Competence and symptoms scores were significantly higher for those with English as an additional language (Table 3).

Modelling

Owing to multicollinearity, separate models were run including SPQ identity or competence as a covariate (Appendix S9). For brevity, results are presented here for models including competence, with any salient differences in models highlighted. Assumptions were tested and validation performed for all models.

Participation involvement

In the intermediate model containing only participation-related constructs (Table 4, model A), all (competence, environment, and symptoms scores) were significantly associated with participation involvement, where increases contributed towards higher participation involvement. In the intermediate model containing confounding variables (Table 4, model B), sex (male), autism (yes), and school support (level III compared with level II) were significantly associated with lower participation involvement. Increasing age was significantly associated with higher participation involvement. In the final model (Table 4, model C), participation-related constructs (competence, environment, and symptoms scores) remained significantly associated with participation involvement after controlling for confounding variables. No confounding variables were significantly associated with the outcome. When analyses were replicated with identity as a covariate, findings remained the same. Identity scores were significantly associated with participation involvement across all analyses, and participation-related constructs remained the only significant associations in the model.

TABLE 3 Means, standard deviations, and correlation analyses of SPQ and demographic variables (n = 668–684)

		Identity			Competence			Symptoms			Environment	
	Mean (SD)	Median (IQR)	ES (p)	Mean (SD)	Median (IQR)	ES (p)	Mean (SD)	Median (IQR)	ES (p)	Mean (SD)	Median (IQR)	ES (p)
Sex												
Male	3.1 (0.6)	3.1 (2.7–3.7)	0.19 (<0.001***)	2.7 (0.7)	2.7 (2.2–3.3)	0.21 (<0.001***)	3.1 (0.6)	3.2 (2.6–3.6)	0.08 (0.040*)	3.5 (0.3)	3.6 (3.3–3.8)	0.03
Female	3.3 (0.6)	3.4 (3.0–3.8)		3.0 (0.7)	3.1 (2.6–3.5)		3.2 (0.6)	3.2 (2.8–3.8)		3.6 (0.3)	3.6 (3.3–3.8)	(0.408)
Looked after												
No	3.2 (0.6)	3.3 (2.8–3.8)	0.04 (0.278)	2.8 (0.7)	2.9 (2.3–3.4)	0.07 (0.075)	3.2 (0.6)	3.2 (2.8–3.6)	0.09 (0.016*)	3.5 (0.3)	3.6 (3.3–3.8)	0.04
Yes	3.1 (0.7)	3.0 (2.7–3.7)		2.6 (0.9)	2.4 (2.0–3.3)		2.9 (0.6)	3.0 (2.4–3.4)		3.5 (0.4)	3.5 (3.2–3.8)	(0.288)
Language												
English	3.2 (0.6)	3.3 (2.8–3.7)	0.01 (0.731)	2.8 (0.7)	2.8 (2.3–3.4)	0.08 (0.048*)	3.1 (0.6)	3.2 (2.7–3.6)	0.08 (0.039*)	3.5 (0.3)	3.6 (3.3–3.8)	0.05
Non-English	3.2 (0.6)	3.3 (2.8–3.8)		3.0 (0.7)	3.0 (2.5–3.6)		3.3 (0.6)	3.4 (2.8–3.8)		3.6 (0.4)	3.7 (3.3–3.9)	(0.220)
Autism												
Yes	3.0 (0.6)	3.0 (2.6–3.4)	0.16 (<0.001***)	2.5 (0.7)	2.5 (2.0–3.0)	0.21 (<0.001***)	3.0 (0.6)	3.2 (2.6–3.6)	0.12 (0.002**)	3.4 (0.4)	3.5 (3.2–3.7)	0.18 (<0.001***)
No	3.2 (0.6)	3.3 (2.9–3.8)		2.9 (0.7)	2.9 (2.4–3.5)		3.2 (0.6)	3.2 (2.8–3.8)		3.6 (0.3)	3.6 (3.4–3.8)	
Support level												
I	3.3 (0.6)	3.4 (3.0–3.8)	0.04	3.0 (0.7)	3.1 (2.5–3.6)	0.05 (<0.001***)	3.3 (0.6)	3.4 (2.8–3.8)	0.03 (<0.001***)	3.6 (0.3)	3.7 (3.4–3.9)	0.03 (<0.001***)
II	3.2 (0.6)	3.3 (2.9–3.8)	(<0.001***)	2.8 (0.7)	2.9 (2.4–3.4)		3.2 (0.6)	3.2 (2.8–3.8)		3.6 (0.3)	3.6 (3.4–3.8)	
III	3.0 (0.7)	3.0 (2.6–3.6)		2.6 (0.7)	2.6 (2.1–3.1)		3.0 (0.6)	3.1 (2.6–3.4)		3.5 (0.3)	3.5 (3.3–3.7)	
			ρ (p)			ρ (p)			ρ (p)			ρ (p)
Age			0.16 (<0.001***)			0.16 (<0.001***)			−0.00 (0.889)			0.03 (0.465)

ES (p) denotes the magnitude of effect size and corresponding p-value.

Wilcoxon rank-sum test with continuity correction was used to measure the association of demographic variables sex, looked after, language, and autism with SPQ. A Kruskal–Wallis test was used to measure the association of support level with SPQ. ρ denotes Spearman's ρ, which was used to measure the association between age and PEM-CY. All SPQ items are rated on a 4-point Likert scale (from 1 'disagree' to 4 'agree'). Higher scores represent a more facilitative school environment (environment scale), favourable child characteristics (identity scale, competence scale), and fewer symptoms (symptoms scale).

*p < 0.05, **p < 0.01, ***p < 0.001.

Abbreviations: IQR, interquartile range; SD, standard deviation; SPQ, School Participation Questionnaire.

TABLE 4 Multilevel linear mixed-effects regression models for participation involvement

Fixed effects									
	Model A (n = 652)			Model B (n = 652)			Model C (n = 652)		
Covariates	**Estimate**	**95% CI**	***p***	**Estimate**	**95% CI**	***p***	**Estimate**	**95% CI**	***p***
Intercept	3.15	3.06–3.23	<0.001***	3.36	2.98–3.74	<0.001***	3.14	2.83–3.44	<0.001***
Competence	0.22	0.19–0.25	<0.001***				0.22	0.19–0.26	<0.001***
Symptoms	0.05	0.02–0.09	0.007**				0.05	0.01–0.08	0.009**
Environment	0.07	0.03–0.10	<0.001***				0.07	0.03–0.11	<0.001***
Sex (male)				−0.23	−0.39 to −0.07	0.004**	0.01	−0.12 to 0.12	0.914
Looked after (yes)				−0.20	−0.55 to 0.12	0.219	−0.05	−0.30 to 0.21	0.719
Language (not English)				0.08	−0.16 to 0.29	0.516	−0.09	−0.27 to 0.09	0.351
Age				0.00	0.00–0.01	0.008**	0.00	−0.00 to 0.00	0.437
Autism (yes)				−0.23	−0.41 to −0.06	0.015*	−0.02	−0.16 to 0.13	0.817
Support level[a] (I vs II)				0.09	−0.09 to 0.29	0.364	−0.14	−0.29 to 0.01	0.055
Support level[a] (III vs II)				−0.30	−0.47 to −0.11	0.002*	−0.11	−0.25 to 0.04	0.149
AIC		1406.3			1722.2			1413.9	
ICC		0.02			0.1			0.02	
Random effects groups: school (n = 22)									
	SD	**95% CI**	**SD**		**95% CI**	**SD**		**95% CI**	
Intercept	0.11	0.00–0.18	0.27		0.14–0.37	0.11		0.00–0.17	
Residual	0.73	0.69–0.77	0.92		0.87–0.97	0.73		0.68–0.76	

Participation involvement: n = 655; mean (SD) = 3.5 (1.0); range = 1–5.

Model A: SPQ Rasch scores; model B: child demographics and characteristics; model C: all variables.

*p < 0.05, **p < 0.01, ***p < 0.001.

Abbreviations: AIC, Akaike information criterion; CI, confidence interval; ICC, intraclass correlation coefficient; SD, standard deviation.

[a]Support level III vs I was also tested and found to be non-significant in all cases.

Participation frequency

In the intermediate model containing only participation-related constructs (Table 5, model A), competence and environment scores were significantly associated with participation frequency, where increases contributed towards higher frequency. In the intermediate model containing confounding variables (Table 5, model B), sex (male), language (not English), autism (yes), and school support (level III compared with level II) were significantly associated with lower participation frequency. Increasing age was also significantly associated with higher participation frequency. In the final model (Table 5, model C), after controlling for confounding variables, competence and environment scores remained significantly associated with participation frequency. Sex (male) and autism (yes) were no longer significantly associated after adjusting for participation-related constructs. Language and school support, however, did remain significantly associated. When models A, B, and C were replicated with identity, the findings were similar. Identity scores were significantly associated with participation frequency across all analyses. However, autism (yes) remained significantly associated in the final model involving identity scores, whereas age and school support levels were not significantly associated.

DISCUSSION

This study contributes to our understanding of participation and significantly extends previous research using the SPQ by using more sophisticated modelling. The study also benefits from a large representative sample.

Using the PEM-CY, participation involvement and frequency were measured. This is important as there may be differences in these outcomes. Involvement in particular is complex, with few available measures to capture it, or understanding of what influences it. For these reasons, it is essential to make a distinction between frequency and involvement. After controlling for confounders, participation-related constructs (as measured by the SPQ) were associated with participation while controlling for confounders. For frequency, a greater range of factors were associated with outcomes, while for involvement only participation-related constructs were important. As part of a body of evidence, this replicates findings that frequency and involvement are

TABLE 5 Multilevel linear mixed-effects regression models for participation frequency

Fixed effects									
	Model A (*n* = 652)			**Model B (*n* = 652)**			**Model C (*n* = 652)**		
Covariates	**Estimate**	**95% CI**	***p***	**Estimate**	**95% CI**	***p***	**Estimate**	**95% CI**	***p***
Intercept	4.11	3.93–4.28	<0.001***	4.05	3.61–4.51	<0.001*	4.02	3.59–4.42	<0.001***
Competence	0.19	0.14–0.23	<0.001***				0.18	0.13–0.23	<0.001***
Symptoms	−0.02	−0.07 to 0.03	0.383				−0.02	−0.07 to 0.03	0.381
Environment	0.06	0.01–0.12	0.021***				0.06	0.01–0.11	0.019*
Sex (male)				−0.19	−0.37 to 0.00	0.047*	−0.03	−0.21 to 0.15	0.766
Looked after (yes)				−0.33	−0.72 to 0.08	0.086	−0.25	−0.58 to 0.09	0.163
Language (not English)				−0.28	−0.56 to −0.00	0.044*	−0.40	−0.67 to −0.14	0.002**
Age				0.01	0.00–0.01	<0.001***	0.00	0.00–0.01	0.046*
Autism (yes)				−0.33	−0.54 to −0.10	0.003**	−0.17	−0.38 to 0.03	0.103
Support level[a] (I vs II)				−0.06	−0.27 to 0.16	0.567	−0.23	−0.43 to −0.01	0.029*
Support level[a] (III vs II)				−0.31	−0.53 to −0.10	0.006**	−0.22	−0.43 to −0.02	0.039*
AIC		1958.5			2035.3			1945.1	
ICC		0.1			0.1			0.1	
Random effects groups: school (*n* = 22)									
	SD	**95% CI**	**SD**		**95% CI**	**SD**		**95% CI**	
Intercept	0.32	0.14–0.44	0.38		0.21–0.51	0.33		0.16–0.45	
Residual	1.05	0.99–1.11	1.11		1.04–1.16	1.03		0.97–1.08	

Participation frequency: *n* = 684; mean (SD) = 4.3 (1.2); range = 0–7.

Model A: SPQ Rasch scores; model B: child demographics and characteristics; model C: all variables.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Abbreviations: AIC, Akaike information criterion; CI, confidence interval; ICC, intraclass correlation coefficient; SD, standard deviation.

[a]Support level III vs I was also tested and found to be non-significant in all cases.

uniquely enabled by environment and within-person factors, as found in early ground-breaking studies,[25] previous research using the SPQ model,[6,7] and wider participation measurement research.[12,13,26,27]

This study allows us to explicate the influence of children's identity and competence on participation. This includes a child's ability to do things such as follow rules and routines, their belief in themselves, and their understanding of and ability to meet responsibilities. While findings suggest these constructs are associated with more frequent and more intensive participation, they may also be strengthened through participation.[3] That is, participation is a means by which children acquire an identity and sense of belonging, and gain an understanding of their responsibilities and contributions to social groups. Participation also affords the opportunity for practice, further building competence.

Our findings confirm previous indications that the relationship between environment and participation differs across settings. Coefficients for environment factors, while generally remaining statistically significant, were lower than for child factors. Previous research has confirmed environmental factors to be a strong predictor of community participation,[27] and comparisons between community and school settings show more pronounced effects of environment in the community over schools.[26] It may be that schools are safe and supported environments where teachers compensate for needs, in contrast to less supportive community settings. Nonetheless, it remains incumbent for practitioners to ensure that children receive supports that include modifications to the physical and social environment, in all settings, including the school.

The SPQ measurement model[5–7] includes child and environment factors, from the perspective of teachers, and has demonstrated consistent associations with participation. The current literature looking at participation has largely relied on operationalizing from 'objective' variables (e.g. income, functional status) or from parents/family members or the person with the disability. Very few or none have asked teachers. This is a useful contribution to show expected patterns of relationships hold even with a reporter that has typically not been used in the literature thus far. It also demonstrates that teachers can validity assess participation and participation-related constructs.

This study contributes understanding about the relationship between children's demographic characteristics, support needs, participation, and participation-related constructs that have implications for policy and practice. We found, after controlling for a range of variables, that there was a relationship between having English as an additional language and reduced participation frequency. Although this is a novel finding in participation research, the 'double disadvantage' of possessing multiple needs has been previously identified.[28] Targeted participation support for children who do not speak the dominant language may therefore be helpful. We also found a relationship between the highest and lowest levels of school support and reduced participation frequency. This may reflect the fact that children have higher levels of need, but do not have supports in place, that their needs have not been identified, or that supports are insufficient. Overall, as highlighted by educationalists and multidisciplinary commentators,[8,16,29] teachers require support in working with these learners, with the potential for participation to be negatively impacted.

When adjusting for participation-related constructs, several demographic characteristics did not maintain significant associations with outcomes. The implication is that, although factors such as language, sex, age, or diagnosis are important, it is the interaction of these with participation-related constructs that determines outcomes. For example, previous research has shown participation restrictions among autistic children.[9,10] In our study, although autistic children did demonstrate reduced participation frequency and involvement, and greater levels of need as measured by the SPQ, autism was not consistently associated with participation in most of the final models. This supports the idea that the level of functioning (as captured by the SPQ) is more important than diagnosis, since diagnosis does not capture the person–environment complexity which determines participation outcomes.

The strengths of this study include the use of robust sampling, measures conceptually matched to evidence-based definitions, and the inclusion of several correlates. The sample was large enough to produce meaningful estimates, and was non-overlapping with previous research. However, it was located in one city, and there are important factors, such as income[26] and mother's educational status,[14] which were not included.

The ultimate goal is to facilitate implementation of evidence-informed approaches to participation. Interventions provided by therapists[30] and teachers[17] are necessary. For teachers, examining the child and environment to understand how and why participation varies is important. Such investigations have practical implications and highlight learners requiring support. This is important as there are children for whom it is difficult to identify what extra provision is needed.[8,29] Collaboration and innovation is required.[16] Over and above children being offered, or having available to them, a range of activities, there are child and environment factors that restrict participation. Therefore, focusing on placement, 'inclusion', or presence is insufficient if increased participation is desired. Finally, research is needed to ascertain which participation differences are meaningful to teachers and families. Currently available measures have little established evidence for what is considered an important difference according to these stakeholders.

CONCLUSION

Participation-related constructs as measured by the SPQ remained associated with participation after controlling for age, sex, level of school support, and autism. For participation frequency, a greater range of factors were associated with outcomes, while for participation involvement only participation-related constructs were important. This suggests that a focus on typical variables of interest may yield insights associated with participation frequency (e.g. how much or how often children participate), but an understanding of participation involvement requires analysis of participation-related constructs. The findings demonstrate that more focus is required on addressing these factors to support children's participation.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on reasonable request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

The following additional material may be found online:
Appendix S1: Detailed sampling methods.
Appendix S2: Additional sample characteristics.
Appendix S3: Generalizability or representatives of sample.
Appendix S4: Items and scales of the SPQ.
Appendix S5: Rasch model analysis of SPQ and detailed

Rasch model analysis statistics.
Appendix S6: Testing model assumptions for full models including competence as a covariate.
Appendix S7: Random effects block bootstrap summary statistics for full models including competence as a covariate.
Appendix S8: Relationship between PEM-CY and SPQ.
Appendix S9: Regression models for participation outcomes involving SPQ subscale Identity.

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