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SHORT REPORT

The association between home learning during COVID-19 lockdowns and subsequent school attendance among children with neurodevelopmental conditions

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Abstract

Background: Children with neurodevelopmental conditions have high levels of school absence. During the COVID-19 pandemic, schools closed for many students. The relationship between home learning during school closures and subsequent school attendance requires attention to better understand the impact of pandemic education policy decisions on this population. This study aims to investigate the association between home learning, hybrid learning and school learning during school closures (in January–March 2021) with subsequent school attendance (in May 2021) in children with neurodevelopmental conditions.

Methods: An online survey was completed by 809 parents/carers of 5- to 15-year-old autistic children and/or children with intellectual disability. Regression models examined the association of learning location during school closures with subsequent school absence (i.e., total days missed, persistent absence and school refusal).

Results: Children who were learning from home during school closures later missed 4.6 days of a possible 19. Children in hybrid and school learning missed 2.4 and 1.6 school days, respectively. The rates of school absence and persistent absence were significantly higher in the home learning group even after adjusting for confounders. Learning location was not associated with subsequent school refusal.

Conclusions: Policies for school closures and learning from home during public health emergencies may exacerbate school attendance problems in this group of vulnerable children.

KEYWORDS
autism, home learning, intellectual disability, school attendance

1 | INTRODUCTION

There is increasing attention to school attendance among autistic children (Adams, 2021; Munkhaugen et al., 2019), autistic children with/out an intellectual disability (Black & Zablotsky, 2018; Totsika et al., 2020) and children with an intellectual disability with/out autism (Melvin et al., 2022). School attendance is a complex phenomenon, and school attendance problems are associated with numerous factors across various systems (Melvin et al., 2019). Research has focused mostly on factors within and across the micro- or meso-system, such as the child (e.g., age; Totsika et al., 2020), the family (e.g., socioeconomic circumstances; Adams, 2021; Melvin et al., 2022; Totsika et al., 2020) or the school (e.g., mainstream or special school; Munkhaugen et al., 2017; Totsika et al., 2020). Our research understanding of macrosystem factors (e.g., government policies on school attendance) is limited. The COVID-19 pandemic national lockdowns and associated school closures to reduce transmission provided an opportunity to examine the impact of learning location on subsequent school attendance in a way that would not be possible under non-pandemic conditions.

There were two major school closures in the United Kingdom after the outbreak of the coronavirus in March 2020. The first closure took place in March–May 2020, and the second closure was in January–March 2021. During school closures, schools remained open for children of key workers and some vulnerable children (e.g., children with an education, health and care [EHC] plan, which is a statutory document describing a child's support needs; children in special schools; Looked After [children in care] and adopted children; and children referred to social care services) (DfE, 2021). Not all vulnerable children were automatically eligible to attend school during school closures. In addition, people with certain underlying health condition(s) were classified as clinically extremely vulnerable by the UK government, and some were advised to shield (i.e., stay at home avoiding contact with other people) (Department of Health and Social Care, 2020). During the first national lockdown in England (i.e., March–June 2020), just 5% of vulnerable students attended school across the whole period, reaching a peak of 11% in May 2020 (Leahy et al., 2021). Seventy-nine percent of vulnerable students with an EHC plan attended school in the spring term (January–April 2021) compared with 90% in the summer term (May–July 2021) (DfE, 2022). These figures indicate that a substantial proportion of vulnerable students, including those with neurodevelopmental conditions, attended school during the school closures in January to March 2021 but there were still a number of vulnerable children who were learning from home (i.e., sometimes also referred to as home schooling). It is yet unclear whether the location of learning during school closures may have affected school attendance later in the academic year when schools re-opened, and school attendance was compulsory for all.

The coronavirus national lockdowns and school closures were unforeseen factors that impacted the educational experiences of children with neurodevelopmental conditions (Simpson & Adams, 2022). It is, therefore, imperative to examine the association of COVID-19 school closures in subsequent school attendance to respond appropriately to the diverse needs of children with neurodevelopmental conditions and to minimize the impact of future school closures on these children. The aim of the present study was to investigate the association between learning location during school closures in the first months of 2021 and subsequent school absenteeism in children with neurodevelopmental conditions in the United Kingdom. In addition to overall absenteeism, we also considered school refusal, which has been reported to be among the most frequent types of absence in children with neurodevelopmental conditions (Adams, 2021; Melvin et al., 2022; Totsika et al., 2020).

Key messages

- Many schools closed during national lockdowns in response to COVID-19.
- Many children with neurodevelopmental conditions were learning from home during school closures.
- Home learning during COVID-19 increased rates of subsequent school absence.
- Age and family socioeconomic deprivation were also associated with school absence.
- School closures may exacerbate school attendance difficulties.

2 | METHODS

2.1 | Study design

An online survey, hosted by Qualtrics, was completed between June and August 2021. Inclusion criteria included being the parent/carer of an autistic child or a child with an intellectual disability, aged 5–15 years old, living in the United Kingdom. The survey collected demographic information about the parent/carer (e.g., age, relationship to the child and socioeconomic deprivation) and the child (e.g., age, neurodevelopmental conditions, additional physical health conditions and shielding history). Parents/carers were also asked to indicate the number of days their child was absent from school during May 2021 (when schools in the United Kingdom were open to all children). For each day absent, parents were asked to indicate if absence was due to school refusal. Refusal was measured using the School Non-Attendance Checklist (Heyne et al., 2019) that defines refusal as school absenteeism instigated by the child, with the parents' knowledge, following emotional distress about school. Finally, parents/carers reported the location of their child's learning during January to March 2021 when schools were closed because of national lockdowns. Location of learning was assessed as (1) at home throughout January to March 2021 (home learning during school closures), (2) at home some days or weeks and in school some days or weeks during this period (hybrid learning during school closures) or (3) in school every day (school learning during school closures).

2.2 | Recruitment

Flyers with information about the study and a link to the study were disseminated online via social media and mailing lists from several charities for children with neurodevelopmental conditions (e.g., autism and/or intellectual disability). Participants followed the online link to the study where they read and downloaded a copy of the information sheet. Parents/carers completed an electronic informed consent form before proceeding with the questionnaire. The survey was hosted by Qualtrics (June to August 2021). Ethical approval for this study was obtained from University College London Research Ethics Committee (Ref number: 20633/001). Participation was voluntary and anonymous following the General Data Protection Regulation (GDPR) guidance for research and the UK Data Protection Act 2018 related to the processing of personal data in the United Kingdom.

2.3 | Participants

Participants ($n = 809$) for this study were 784 parents and 25 carers (e.g., relative or guardian) who provided information about their child's learning location during the January–March 2021 school closures. These were the parents/carers of 480 children who were engaged in home learning during school closures, 154 children in hybrid learning (home and school) and 175 children in school every day during school closures. Groups differed significantly on age, presence of intellectual disability, mean number of neurodevelopmental conditions and the presence of a formal Special Education Needs and Disabilities (SEND) support plan. The mean age of the home, hybrid and school learning groups was 10.94 ± 2.79 years, 10.03 ± 3.09 years and 9.77 ± 3.09 years, respectively. There was a significant difference in the age of children across groups ($P < .001$) with younger children more likely to be in school every day during school closures. Children with an intellectual disability were more likely to go to school every day or be in hybrid learning during January–March 2021 relative to children in home learning ($P = .006$). The mean number of neurodevelopmental conditions was statistically significantly different with 2.2 neurodevelopmental conditions for children in the school learning group compared with home ($M = 1.8$) and hybrid ($M = 1.9$) learning groups ($P < .001$). Additionally, children who had a formal recognition of their special educational needs through having a SEND plan were more likely to be at school every day during COVID-19 restrictions ($P = .001$). Detailed characteristics of participants are presented in Table 1.

2.4 | Data analysis

Descriptive statistics were used to describe participants' demographic characteristics. The number of neurodevelopmental conditions variable was created by summing the total number from a list of 12 possible neurodevelopmental conditions as indicated by parents/carers. A shielding history variable was constructed by counting the instances of shielding (where the child spent more than 50% of the time at home avoiding contact) in March–June 2020, July–August 2020, September–December 2020, January–April 2021 and May 2021–survey date. Scores ranged from 0 to 5 with higher values suggesting that the child was shielding for more periods. A composite measure of family socioeconomic deprivation was created by summing four binary variables including household unemployment (one employed adult in

TABLE 1 Sociodemographic characteristics for children with neurodevelopmental conditions and their families.

Characteristic	Home learning *N* (%)	Hybrid learning *N* (%)	School learning *N* (%)	Total	*P* value
Total	480 (100)	154 (100)	175 (100)	809 (100)	
Mean (SD) age of child; range in years	10.94 (2.79) 5–15	10.03 (3.09) 5–15	9.77 (3.09) 5–15	10.52 (2.96) 5–15	<.001
Child is male	323 (68)	106 (69)	122 (70)	551 (69)	.822
Child has autism	396 (82)	117 (76)	147 (84)	660 (82)	.124
Child has intellectual disability	164 (34)	68 (45)	81 (47)	313 (39)	.006
Mean (SD) number of NDCs	1.8 (0.98)	1.9 (1.21)	2.2 (1.05)	1.9 (1.05)	<.001
Additional physical problems present[a]	136 (29)	37 (24)	49 (28)	222 (27)	.571
Mean (SD) of child's shielding history[b]	0.24 (.91)	0.21 (.80)	0.13 (.55)	0.21 (.82)	.308
Child has SEND plan	330 (69)	118 (77)	148 (85)	596 (74)	<.001
Respondent is mother	451 (94)	142 (92)	159 (91)	752 (93)	.382
Mean (SD) age of parent/carer; range in years	43.94 (6.62) 25–67	42.41 (7.82) 24–73	43.54 (8.23) 26–73	43.57 (7.24) 24–73	.89
Mean (SD) socioeconomic deprivation	1.58 (0.78)	1.58 (0.78)	1.50 (0.75)	1.56 (0.77)	.479

Abbreviations: NDC, neurodevelopmental conditions; SEND, special educational needs and disabilities.

[a]Including epilepsy, asthma, eating disorders, obesity, cancer, Crohn's disease, cystic fibrosis and health condition.

[b]Shielding period covers five instances of shielding (i.e., staying at home more than 50% of the time avoiding contact with others) in the period between March 2020 and May 2021.

the house vs. no employed adults), parent/carer level of educational qualifications (at/above university degree level vs. below degree level), single-parent household (household with two or more parents/carers vs. single-parent household) and subjective poverty (family managing financially vs. family struggling financially). Scores ranged from 0 to 4 with higher values indicating higher socioeconomic deprivation.

Two regression models examined the association between learning location during the January–March 2021 lockdown and subsequent school attendance in May 2021: A zero-inflated negative binomial model was performed for total days absent from school, and a logistic regression model was performed for persistent absence (missing 10% of more of the 19 available days). Models controlled for potential confounders including child age, number of neurodevelopmental conditions, additional physical health conditions, shielding history and family's socioeconomic deprivation. Confounders were selected for inclusion in the regression models based on their bivariate correlation with the outcome (Pearson's $r \geq .05$). Supplementary analyses replicated these models, this time including autism and intellectual disability instead of number of neurodevelopmental conditions so as to examine the independent association of autism and intellectual disability with the absenteeism outcomes over and above any effects of learning location. A final zero-inflated negative binomial model examined the association of learning location during the January–March 2021 lockdown and school refusal in May 2021. Adjusted risk ratios (ARRs) with 95% confidence interval (CI) are reported in Tables 2, 3 and S1. Analyses were performed in SPSS version 27 and Stata version 17 (zero-inflated models).

3 | RESULTS

The mean number of school days absent in May 2021 among children with neurodevelopmental conditions in the home learning group during school closures was 4.6 days (SD = 7.14, range 0–19). Further, 41% of children in the home learning ($n = 194$) presented with persistent absence (≥10% of available sessions) in May 2021. Children who, during school closures, were in the hybrid learning group missed 2.4 school days in May 2021 (SD = 4.82, range 0–19) and 29% ($n = 45$) of those missed more than 10% of available sessions in May 2021 (i.e., persistent absence). Finally, children who, during school closures, were in the school learning group missed 1.6 school days (SD = 4.38, range 0–19) in May 2021 and 20% ($n = 35$) of those presented with persistent absence.

The rate of school absence in the home learning group was higher by 111% (ARR: 2.11 [95% CI: 1.36, 3.28]), and home learning children were 145% more likely to present with persistent absence (ARR: 2.45

TABLE 3 The association between learning location during school closures and later school refusal, controlling for child and family characteristics.

Variable	Refusal going to school[a] ARR (95% CI)
Home learning	1.75 (0.99, 3.06)
School learning	1.26 (0.57, 2.77)
Hybrid learning	Reference group
Child age	1.13 (1.01, 1.27)*
No of neurodevelopmental conditions	0.78 (0.53, 1.11)
Child having additional physical health problems	1.03 (0.90, 1.17)
Child shielding history	1.02 (0.83, 1.26)
Family socioeconomic deprivation	1.18 (1.25, 1.45)*

Note: Adjusted risk ratios (ARR) are reported.
[a]Zero-inflated negative binomial regression (total days).
*P value < .05.

TABLE 2 The association between learning location during school closures with later school absence controlling for child and family characteristics.

Variable	Total days absent[a] ARR (95% CI)	Persistent absence[b] ARR (95% CI)	Total days absent[a] ARR (95% CI)	Persistent absence[b] ARR (95% CI)
Home learning	2.11 (1.36, 3.28)*	2.45 (1.60, 3.75)*	1.59 (1.14, 2.22)*	1.51 (1.01, 2.26)*
School learning	Reference group	Reference group	0.75 (0.45, 1.25)	0.61 (0.36, 1.03)
Hybrid learning	1.32 (0.76, 2.19)	1.63 (0.97, 2.75)	Reference group	Reference group
Child age	1.09 (1.04, 1.14)*	1.10 (1.04, 1.16)*	1.09 (1.04, 1.14)*	1.09 (1.04, 1.15)*
No of neurodevelopmental conditions	0.98 (0.88, 1.08)	0.99 (0.87, 1.13)	0.98 (0.88, 1.08)	1.05 (0.91, 1.22)
Child having additional physical health problems	0.90 (0.70, 1.16)	0.76 (0.54, 1.07)	0.90 (0.70, 1.16)	0.77 (0.75, 1.09)
Child shielding history	1.07 (0.99, 1.17)	1.16 (0.98, 1.38)	1.07 (0.99, 1.17)	1.16 (0.98, 1.38)
Family socioeconomic deprivation	1.18 (1.01, 1.37)*	1.22 (1.00, 1.49)*	1.18 (1.01, 1.37)*	1.23 (1.01, 1.50)*

Note: Adjusted risk ratios (ARR) are reported.
[a]Zero-inflated negative binomial regression (total days).
[b]Logistic regression (persistent absence).
*P value < .05.

[95% CI: 1.60, 3.75]) compared with children attending school daily. The rate of school absenteeism increased by 59% among children with neurodevelopmental conditions in the home learning group (ARR: 1.59 [95% CI: 1.14, 2.22]) compared with hybrid learning during school closures. Children in home learning during school closures in January–March 2021 were 51% (ARR: 1.51 [95% CI: 1.01, 2.26]) more likely to present with persistent absence compared with those in the hybrid learning group. Older children and children in families living in socioeconomic deprivation had higher rates of school absence and persistent absence. A higher number of co-occurring neurodevelopmental conditions, the presence of additional physical conditions and the child's shielding history were not associated with total days absence or persistent absence. Regression results are presented in Table 2.

Supplementary analyses examined whether the presence of autism or intellectual disability were independently associated with school absence controlling for the effect of all other factors (see Table S1). Findings were identical to the main regression models while the presence of autism (total absence: ARR: 0.99 [95% CI: 0.70, 1.40]; persistent absence: ARR: 0.88 [95% CI: 0.57, 1.34]) or intellectual disability (total absence: ARR: 0.78 [95% CI: 0.60, 1.02]; persistent absence: ARR: 1.16 [95% CI: 0.84, 1.64]) was not significantly associated with school absence. Finally, the learning location during school closures in January–March 2021 was not associated with subsequent absence due to school refusal in children with neurodevelopmental conditions. Regression results are presented in Table 3.

4 | DISCUSSION

The COVID-19 pandemic is a global crisis with potential consequences for children's school attendance, learning, and academic progress, especially those children with neurodevelopmental conditions. To our knowledge, this is the first study to explore the association of school closure during the pandemic with subsequent school absenteeism in children with neurodevelopmental conditions. In this study, the rate of persistent absence (41%) was significantly higher among children with neurodevelopmental conditions who were learning from home throughout school closures in January–March 2021 compared with children who were going to school every day or were dividing their time between home and school during that period. In 2018/2019, 25% of children with special educational needs experienced persistent absence (DfE, 2020). In the present study, children learning from home during school closures were 145% more likely to present with persistent absence in May 2021 compared with children who went to school every day during school closures. While our data do not provide information on the mechanism through which home learning during school closures was associated with a higher rate of school absence when schools re-opened, it is likely that when schools re-opened and school attendance became compulsory for all students, there was a lack of school resources to support the transition back into class for some children with neurodevelopmental conditions (Code et al., 2022).

Children with a SEND plan were more likely to go to school during school closures. The study findings cannot indicate whether children who attended school during school closures were more likely to attend school later because of the protective effect of regular school attendance or because having a SEND plan ensured more support was available in school which in turn made children more likely to attend. Future research should investigate school attendance more closely among children with neurodevelopmental conditions who have a formal recognition of their special educational needs. Of the potential confounders examined in the analyses, older child age and higher level of family socioeconomic deprivation were associated with a higher rate of absence and a higher likelihood of persistent absence, similar to findings from studies before the pandemic (Adams, 2021; Fleming et al., 2020; John et al., 2022; Totsika et al., 2020). Interestingly, supplementary analyses that examined the independent association of autism and intellectual disability indicated the presence of these specific neurodevelopmental conditions were not significantly associated with school absenteeism over and above the effect of home learning location and other study covariates. We further examined whether learning location was associated with a specific type of absenteeism, namely, school refusal. School refusal is the most prevalent type of absence in autistic children (Adams, 2021; Totsika et al., 2020) and as a type refers to absence accompanied by emotional distress because the child is reluctant to attend (Heyne et al., 2019). Our findings indicated that home learning location was not associated with a higher rate of school refusal later.

4.1 | Strengths and limitations

The survey addressed a gap in the literature on the impact of school closures on school attendance for children with neurodevelopmental conditions. The study recruited parents/carers across the four nations of the United Kingdom and examined school attendance during May 2021 (approximately 1 year after the pandemic started in the United Kingdom), a month when school attendance was compulsory for all students. However, several sampling biases are likely. Parents/carers in the study needed to be technology literate to take part in the online study that was also advertised predominantly online. In addition, respondents were recruited via several charities across the United Kingdom, so parents/carers not in contact with these charities are likely to be underrepresented in this study. Information on the location of learning during the January–March 2021 lockdown was collected retrospectively, and therefore we cannot rule out recall bias. A significant limitation of the study was not controlling for pre-COVID-19 attendance levels, and for this, the true effect of the school closure disruption on school attendance patterns is difficult to disentangle from likely pre-existing difficulties with school attendance.

5 | CONCLUSION

For children with neurodevelopmental conditions, home learning during the pandemic may have negatively impacted subsequent school attendance. School closure and the associated challenges of home

learning in children with neurodevelopmental conditions require further examination to identify efficient models of attendance support. These findings emphasize that children with neurodevelopmental conditions require additional support returning to school following home or hybrid learning.

AUTHOR CONTRIBUTIONS

Vasiliki Totsika, Richard P. Hastings, Kylie Gray, Bruce Tonge, Glenn A. Melvin, David Heyne and Amanda Allard conceived and designed the study. Athanasia Kouroupa and Vasiliki Totsika managed the study. Athanasia Kouroupa collected the data and performed the data analysis supervised by Vasiliki Totsika and wrote the manuscript. All authors provided critical feedback, contributed to the final manuscript and agreed to the publication of the article.

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CONFLICT OF INTEREST STATEMENT

None.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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