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ARTICLE

Physical activity, sports participation and school exclusion: An analysis of the millennium cohort study

A. J. Brinkley

School of Sport, Rehabilitation and Exercise Sciences, University of Essex, Colchester, UK

Correspondence
A. J. Brinkley, School of Sport, Rehabilitation and Exercise Sciences, University of Essex, Colchester CO4 3SQ, UK.
Email: andrew.brinkley@essex.ac.uk

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Abstract

Background: Physical activity and modes of sport are widely adopted to promote health, wellbeing, behavioural outcomes and educational attainment in young people excluded from education. However, little is known about the physical activity or sports involvement of excluded young people or the role of participation on predictors and outcomes associated with exclusion.

Aims: The study aimed to understand (i) how active excluded young people are, (ii) whether predictors of school exclusion are influenced by participation in physical activity or sport and (iii) if physical activity or sports participation moderates the relationship between school exclusion and health, behavioural and educational outcomes.

Methods: Millennium Cohort Study Wave 6 data were analysed using linear multiple regression models. Participants were 11,066 young people. Dependent variables were physical activity or sports participation. Independent variables included school exclusion, body composition and physical health, cognitive and educational outcomes, crime, antisocial and harmful behaviours, mental health and individual demographic predictors.

Results: Multiple regression analysis of Millennium Cohort Study Wave 6 data indicates young people excluded from education participate in more (+20.71 ± 9.72, $p = .03$) minutes of physical activity but less (−22.38 ± 32.52, $p = .49$) minutes of sport than non-excluded participants. Physical activity or sport did not influence predictors or outcomes associated with exclusion.

Conclusion: Findings indicate young people excluded from education participate in 8% more MVPA, but 13% less sport

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than peers not excluded from education. These findings highlight concerns related to the provision of school sports and physical education opportunities for young people excluded from education. Moreover, these findings question the role of physical activity or sport as a silver bullet within UK educational policy.

KEYWORDS
cross-sectional, exercise, expulsion, off-rolling, policy, suspension

INTRODUCTION

School exclusion predicts mental health and psychiatric problems (Tejerina-Arreal et al., 2020), reduced educational attainment (Parker et al., 2016), anti-social and harmful behaviours (Parker et al., 2016), entrance into the criminal justice system and not being in education, employment or training (i.e., NEET) post-16 years of age (Gill et al., 2017). These outcomes are not only experienced in the short-term but present as predictors of social exclusion within adulthood (Gill et al., 2017). Prolonged school absence such as that experienced through bouts of fixed-term (i.e., suspension of school attendance for a fixed period of time) or permanent exclusion (i.e., a young person is no longer allowed to attend school) is likewise associated with the reduced development of fundamental movement skills and a subsequently increased risk-ratio for cardiometabolic and cardiorespiratory health (O'Brien et al., 2015). These markers are associated with reduced participation in physical activity (Vasilopoulos & Ellefson, 2021) and commodities in adult life (Shepherd & Purcell, 2015). Within England, the rate of permanent exclusion has ranged between .03% and .10% (.13%–.20% in secondary education) since 2015 (DoE, 2021). Fixed-term exclusion is a predictor of permanent exclusion and on average 3.76% of young people per day are excluded from education temporarily (DoE, 2021). The total economic cost for each cohort excluded from education is calculated upwards of £2 billion within England (Gill et al., 2017).

Young people are excluded from education due to behavioural disorders, aggressive, abusive, and maladaptive behaviour, violence such as assault against pupils and adults, bullying and drug and damage-related crime, which are influenced by a host of interpersonal, environmental and policy determinants (DoE, 2021). Cohort data indicates school exclusion is predicted by gender (i.e., males are more likely to be excluded), socio-economic status, psychopathy, mental health, social and behavioural difficulties, anti-social behaviour, low educational attainment and special educational needs and disability (SEND) (Tejerina-Arreal et al., 2020). A body of mechanistic and theoretical evidence drawn from young people not excluded from education has suggested participation in physical activity may influence the strength and direction of these relationships (Anderson-Butcher, 2019; Biddle et al., 2019; Sandford et al., 2008). However, the extent to which this relationship exists in populations of young people excluded from education is unknown.

A range of multi-component interventions set within mainstream and alternative provisions (AP; i.e., an education establishment for young people who cannot attend mainstream education, such as pupil referral units; PRU) exist for young people at risk of exclusion or who have been excluded from education (Valdebenito et al., 2018). Despite poor pupil-level acceptability and feasibility, these interventions have demonstrated efficacy in preventing exclusion, improving health, educational and behavioural outcomes and promoting reintegration into mainstream schools (Valdebenito et al., 2018). Increasing physical activity (i.e., sports, exercise, movement, active transport) participation via universal opportunity likewise has a history of use by policymakers, deliverers and stakeholders as an intervention to promote positive adaptations and impart *life skills* to at-risk young people (Sandford et al., 2008). Indeed, programmes which provide targeted or universal opportunities for excluded or at-risk young people, parsimoniously attempt to increase moderate to vigorous physical activity (MVPA) volume and/or intensity, often via promoting sport (Sandford et al., 2008). Given the volume of evidence which

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indicates increasing MVPA behaviour may hold positive biological, neurological and social implications for young people not excluded from education, this is perhaps not surprising (Biddle et al., 2019).

This evidence also suggests sports participation (i.e., an informal/formal and competitive/non-competitive physical activity which follows structured rules and traditions (Lombardo, 2012)) can improve resilience and pro-social behaviour and provide an avenue for behaviour management when social capital is facilitated (Anderson-Butcher, 2019). This is known as positive youth development, a widely adopted strength-based concept in which young people alongside participation in sports are taught positive life skills, attributes and behaviours (Sandford et al., 2008). While physical activity may not hold the capacity to influence environmental and policy-level predictors of exclusion (e.g., socioeconomic status) there is some evidence factors predicting exclusion such as aggressive, abusive, disordered and maladaptive behaviour and outcomes associated with exclusion such as reduced health, social, educational and behavioural trajectories can be influenced by participation in MVPA (Anderson-Butcher, 2019).

However, the extent to which this is known within a cohort of excluded young people is limited to small-scale pilot studies and insight research. Evidence from this setting representing the role of sport and physical activity is sparse and is often not reported robustly. For example, little is known about the extent to which providing sports opportunities or increasing MVPA participation alone may contribute to reducing the impact of predictors of exclusion. Addressing this question is important given the promotion of sports and regular MVPA is perceived as a silver bullet within the UK and global health policy.

Researchers have argued providing sport alone or increasing participation in physical activity (i.e., traditional sport-for-development) in the implicit or explicit hope it can impart life skills, build character, promote health, reduce social exclusion and improve educational attainment is simplistic and grounded in little evidence (Coalter, 2012). These arguments are perhaps evident, given sports provisions often fail to reach individuals in the most deprived settings (Coalter, 2012). While population data is available which provides insight into the physical activity behaviour of young people (e.g., Active Lives) across some social environmental predictors of school exclusion and behaviour (e.g., socio-economic status, multiple deprivations, SEND), less is known about the activity levels of young people excluded from education and indeed the extent in which school exclusion shapes these predictors or indeed predicts physical activity participation. Given the debate highlighted within research and practice of governmental, third-sector and educational policymakers, the present study sought to understand the extent to which participation in MVPA or sport is associated with the education, health and behaviour of young people excluded from education. Given the absence of longitudinal data which tracks these trajectories, this study presents the first cross-sectional analysis of these relationships with Millennium Cohort Study (MCS) data.

Study objectives

The study aimed to understand (i) how active excluded young people are, (ii) whether predictors of school exclusion are influenced by participation in physical activity and (iii) if physical activity moderates the relationship between school exclusion and health, behavioural and educational outcomes.

METHODOLOGY

Design and sampling

The present study reports data from the MCS (a prospective longitudinal birth cohort study of young people born between September 2000 and January 2002 in the UK) and specifically the 2015 6th data sweep (MCS6; Connelly & Platt, 2014). The MCS6 reports data from young people and their parents. The MCS6 was selected as the young people sampled were at the time secondary-school age (11–16 years; $n = 11{,}859$; $13.77 \pm .45$ years; 50.1% male), and were studying for GCSE qualifications. Further, the MCS6 reports outcomes and predictors related to physical activity and sports

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participation, health, behaviour and school exclusion. Within the MCS6 sample, school exclusion data was available from 11,066 participants ($n = 661$; 5.97% report at least one exclusion from school). When accounting for *off-rolling* (i.e., an illegal exclusion where a pupil is removed from a school's record and in effect excluded (Gill et al., 2017)), this remains consistent with population data from the same population data sweep (4.76%; DoE, 2021). Therefore, sample weighting was not applied. Data were drawn from a sample of England (65%), Wales (13.8%), Scotland (10.8%) and Northern Ireland (9.6%). Data from England was drawn from the Northeast (2.8%), Northwest (8%), Yorkshire (7.7%), East Midlands (5.5%), West Midlands (7.8%), East of England (7.4%), London (9.7%), Southeast (10.6%) and the Southwest (5.8%). Within the MCS, home nations with the exemption of England are considered regions. The MCS is not designed to provide a complete representative insight into the population; however, to ensure a sound representation a stratification process was applied to ensure that children living in areas of high deprivation were oversampled (Connelly & Platt, 2014). The MCS is conducted by IPSOS Mori whereby a (i) household questionnaire (complete by parents), (ii) main parent and (iii) partner questionnaire, (iv) participant (young person) questionnaire, (v) cognitive assessment for parents, partners and participants, (vi) series of physical measurement, (vii) saliva samples and (viii) time-use diaries and accelerometers were delivered. A global and stratified (across exclusion status) overview of participant demographic data is provided in Table 1. Ethical approval for the MCS was provided by the Southwest, London and Yorkshire Multi-Centre Research

TABLE 1 Participant demographics stratified across school exclusion.

	MCS ($n = 11,859$)	Non-exclusion ($n = 11,008$)	Fixed-term exclusion ($n = 661$)	Permanent exclusion ($n = 59$)
Age	13.77 ± .45	13.77 ± .45	13.77 ± .46	13.75 ± .47
Gender (female)	40.4%	51%	30.3%	27.1%
Ethnicity (White)	76.5%	80.2%	72.%	72.3%
Mixed ethnicity	4.7%	4.6%	7.8%	4.3%
Asian	11.1%	11%	10.5%	14.9%
Black	3.2%	3.1%	5.6%	2.1%
Other	1.4%	1.2%	3.3%	6.4%
Household income (weekly)	409.89 ± 177.91	419.28 ± 177.21	282.38 ± 131.96	233.09 ± 97.03
Special educational need (Dyslexia)	32.9%	34.9%	19.9%	5.6%
Dyspraxia	25.2%	25.4%	24.3%	22.2%
ADHD	13.2%	9.7%	35.3%	22.2%
Autism and Asperger's	25.1%	23.4%	36.0%	38.9%
Behavioural problems	8.1%	4.7%	29.4%	44.4%
Speech and language	10.1%	10.0%	10.3%	–
Medical condition	5.3%	5.8%	2.2%	–
Psychiatric condition	2.7%	2.6%	3.7%	11.1%
Trauma	.2%	.2%	–	–
Free school meals (yes)	4.7%	4.4%	10.4%	30.8%
IMD (overall)	5.31 ± 2.98	5.43 ± 2.97	3.74 ± 2.61	3.08 ± 1.95
IMD (income)	5.25 ± 2.99	5.36 ± 2.98	3.68 ± 2.64	3.03 ± 1.92
IMD (employability)	5.34 ± 2.92	5.45 ± 2.91	3.85 ± 2.62	3.36 ± 2.17
IMD (health and disability)	5.42 ± 2.92	5.52 ± 2.92	4.0 ± 2.62	3.31 ± 2.16
IMD (education and training)	5.47 ± 2.95	5.5 ± 2.94	5.16 ± 2.99	5.10 ± 3.33
IMD (barriers to housing services)	5.35 ± 2.94	5.45 ± 2.94	4.08 ± 2.75	3.33 ± 2.24

Note: Millennium Cohort Study (MCS); data expressed as M ± *SD* (mean ± standard deviation); percentages expressed for categorical variables; index of multiple deprivation (IMD) (1 = most deprived– 10 = least deprived).

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Ethics Committees (MCS6 approval: 13/LO/1786) and conducted under ethical committee approval from the National Health Service (NHS) Research Ethics Committee. Written parental consent was provided and informed consent was obtained from all young people.

Measures

School exclusion

School exclusion was understood via questions of the parent interview of the MCS6. Four items were included (fixed-term and permanent exclusion (yes/no) and frequency of fixed-term and permanent exclusion). These data provide a stronger representation of a school exclusion due to off-rolling.

Physical activity

Data collection was limited to a sub-sample of participants (i.e., limited stock of accelerometers; 81%) randomly sampled within England (Heywood, 2018). All participants within Scotland, Wales and Northern Ireland were eligible to participate. Data were provided via an objective accelerometer (physical activity; Connelly & Platt, 2014). Participants ($n = 10{,}337$) were asked to wear a GENEActiv Original™ on their wrist on a randomly selected weekday and weekend day for 24-h periods. Data from 6233 was available for analysis. Of these data, 4804 ($n = 645$ one valid day of data) were eligible for analysis. Data were recorded as accelerometer counts averaged across 5 s intervals (epoch). Data were processed by the Centre of Longitudinal Studies (CLS) on the GGIR package on R. The variable included within the analysis was the mean total minutes of MVPA, defined as an acceleration (Euclidean Norm Minus One) beyond 100 mg. Data drawn from accelerometers is presented as mean ± standard deviation as a sum of both days.

Sports participation

Sports participation used the same sample outlined above and was understood engagement through a time-use diary completed online (24.9% of participants), via an app (69% of participants) or on paper (6.1% of participants) over the same two-day period in which participants wore an accelerometer (Connelly & Platt, 2014). The time-use diary required participants to record what they were doing, who they were with, and how much they enjoyed an activity within 10-min slots from 04:00 AM to 04:00 AM the following day. Only data related to activity mode is considered within the present study. Data were collected across 44 activities (for an overview please see Mireku (Mireku, 2021)), within each 10-min slot. Data were calculated as the sum of the total volume of time a young person spent (i) playing individual ball sports, (ii) team sports and participating in (iii) swimming and water sports on a sum of a weekend and weekday. Cases with missing data (i.e., a zero value) or cases which did not include sport and physical activity data were excluded from the analysis. A full profile of the cohort's behaviour over week and weekend days has been recently published (Mireku, 2021). Data drawn from time use diaries is presented as mean ± standard deviation as a sum of both days.

Body composition and physical health

Measures of height (via a Leicester Height Stadiometer) and weight and body fat percentage (via Tanita Scales – BF522W) were recorded from participants. Body Mass Index was calculated (kg/m^2). Health status was understood through a single self-report item assessed on a five-point Likert scale, whereby one represented poor health and five denoted excellent health.

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Cognitive outcomes

Participants were invited to complete the Cambridge Gambling Task (CGT; Robbins et al., 1994) and a word activity. The CGT is a component of the CANTAB (Cambridge Neuropsychological Test Automated Battery; Robbins et al., 1994) which assesses executive function (decision-making and risk-taking behaviour). The CGT presents a participant with a row of 10 red and/or blue boxes. The participant was required to decide if a 'token' was hidden in a red box or a blue box. Participants started the task with several points and had to decide the number of points they were willing to risk on their decision (i.e., gambling). The purpose of the task was to accumulate as many points as possible. In addition, participants completed a word activity (delivered via a tablet) which understood the meaning of words. The task adopted successfully within the British Cohort Study and devised by the University of Edinburgh in 1976 presents a participant with a list of target words. These target words each had five other words alongside these. The participant was required to select, from the five options, a word which best represented the target word. In total, 20 target words were specified which differed across participants.

Societal health outcomes

To understand the prevalence and frequency of forms of crime and anti-social behaviour participants were asked a series of self-report questions on gang membership and the frequency of anti-social and harmful (i.e., smoking, recreational drug use, alcohol, binge drinking, gambling) behaviour. These items were calculated as a sum whereby 1 indicated yes and 0 no. A higher score indicated greater anti-social behaviour.

Educational outcomes

Experience of education was assessed across markers of academic self-efficacy and educational engagement. Data representing self-efficacy were drawn from five self-report items which denoted the extent to which young people believed they were good at English, Maths, Science and Physical Education (PE). Participants rated their self-efficacy on a four-point Likert scale (1 = strongly disagree, 4 = strongly agree). Academic self-efficacy was calculated as the total sum score across these four school subjects, where a higher score represented greater self-efficacy. These scales reported poor internal consistency ($\alpha = .54$). Challenges with educational engagement were understood through a self-report scale. This understood engagement across six items (two items reversed scored), where participants responded to a series of statements. These statements were rated on a Likert scale ranging from 1 = never to 4 = all the time. A total score was calculated as a sum of all items, whereby higher scores reflected greater issues with educational engagement. These items reported an acceptable internal consistency score ($\alpha = .75$).

Mental health and wellbeing

Parents completed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), which measures a participant's psychological attributes across 25 items. Data were calculated as conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviour scores. Whereby higher scores reflect a greater agreement (Goodman, 1997). In the present study and sample, the SDQ reported internal consistency scores ranging from $\alpha = .56$ to .93. Participants also completed the Moods and Feelings Scale-Short Form (MFQ; Angold et al., 1995), Shortened Rosenberg Self-Esteem Scale (RSE; Rosenberg, 2015) and three items from the Social Provisions Scale-Short Form (SPS; Orpana et al., 2019). The MFQ is constructed from 13 items whereby participants respond to the extent to which

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a statement is 'true', 'sometimes true' or 'true'. Scores are calculated as a total value, whereby scores greater than 12 represent the presence of depression (Angold et al., 1995). Internal consistency scores were calculated as $\alpha = .92$. The RSE (Rosenberg, 2015) is comprised of five items rated on a four-point Likert scale ranging from strongly disagree to strongly agree. The RSE reported strong internal consistency ($\alpha = .91$). ADHD was understood through a dichotomous self-report (yes/no) item.

Individual and social demographic variables

Data were collected via self-report questions on age, gender, ethnicity, combined weekly household income (SES), SEND, free school meals eligibility and postcode. Postcode was converted as a proxy measure of multiple deprivations using the Indices of Deprivation 2004 (1 = most deprived–10 = least deprived) by the CLS.

Data analysis

Descriptive analysis

Data were analysed using JASP™ (Version 0.16) and the R™ beta version module. Descriptive statistics (mean ± standard deviation) and frequencies for categorical variables were calculated. Outliners within the data (e.g., extreme values for MVPA minutes; >2000 min) were removed from the analysis. Data were normally distributed within acceptable ranges for skewedness (±3) and kurtosis (±10). Independent *t*-tests and chi-square for independence (χ^2) were calculated for categorical variables. Bivariate correlations were constructed (alpha set at $p = .05$) between continuous variables. Models met the assumptions for the independence of errors, homoscedasticity, residual error and multicollinearity.

Main analysis

To understand the MVPA and sports participation of young people excluded from education, multiple regression models were fitted. To control for variation in physical activity or sports participation across explanatory variables, exclusion, age, gender, SES and multiple deprivation were entered as covariates within each model. To investigate the extent to which predictors of school exclusion were modifiable by participation in regular MVPA, a series of multiple regression models were constructed. Cohort studies (Tejerina-Arreal et al., 2020) have identified several predictors of school exclusion (i.e., mental health, social and behavioural difficulties, anti-social behaviour, low educational attainment) which may be modifiable by participation in MVPA (Biddle et al., 2019). These variables were entered as dependent variables and MVPA or sport were entered as independent variables alongside a series of explanatory variables (i.e., age, health status, school exclusion frequency, gender, socio-economic status, multiple deprivation, SEND). In the case of ADHD (yes/no), a logistic regression model with the same predictors was constructed.

Moderation effect

To examine any potential moderation effects on the relationship between school exclusion frequency and outcomes (i.e., health, behavioural, employment, societal and educational) a series of multiple regression moderation models were constructed. Dependent variables included BMI, mental health, emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, prosocial behaviour, educational engagement, self-esteem and cognitive function (word score, risk-taking behaviour). Within each model, school exclusion, age, gender, minutes of MVPA or sport, SES, multiple

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deprivation, health status and ADHD were entered as predictors. Within each model, an interaction effect between minutes of MVPA or sport and school exclusion was entered to examine the moderating role of physical activity or sport on the relationship between school exclusion and the series of dependent variables mentioned above.

RESULTS

Descriptive statistics and bivariant correlations

Unadjusted analysis indicates young people participated in 252.76 ± 105.58 minutes of MVPA over a week and weekend day. Unadjusted analysis drawn from time-use diary data indicates over a week and weekend day young people participate in 158.70 ± 139.06 minutes of sport. Analysis from bivariant correlations is reported in Table 2. Health status (−.26), academic self-confidence (−.56), and educational engagement (−2.19) differed significantly ($p = <.001$) between young people who had been excluded from education and those who had not.

How active are young people excluded from education?

Models representing minutes of MVPA ($F^{(5,4104)} = 19.32$, $p = .001$, $R^2 = .02$) and sport ($F^{(5,1271)} = 10.84$, $p = .001$, $R^2 = .04$) significantly fitted the data. Models controlling for SES, multiple deprivation, age and gender, indicate young people who have been excluded from school participate in 20.71 ± 9.72 minutes more of MVPA ($p = .03$) but −22.38 ± 32.52 minutes less of sport ($p = .49$). An overview of each model is presented in Table 3.

Are predictors of school exclusion influenced by participation in physical activity?

Data predicting MVPA's impact on mental health ($F^{(8,117)} = 3.18$, $p = .001$, $R^2 = .19$), emotional symptoms ($F^{(8,117)} = 4.25$, $p = .001$, $R^2 = .24$), conduct problems ($F^{(8,117)} = 3.36$, $p = .002$, $R^2 = .20$), hyperactivity/inattention ($F^{(8,116)} = 3.21$, $p = .003$, $R^2 = .13$), peer relationship problems ($F^{(8,119)} = 2.49$, $p = .01$, $R^2 = .15$) and educational engagement fitted the data. Upon controlling for age, health status, exclusion frequency, SES, multiple deprivation, SEND and gender, none of the models constructed indicated minutes of MVPA significantly predicted mental health, conduct problems, hyperactivity/inattention, peer relationship problems, prosocial behaviour and educational engagement. Models predicting school discipline, educational attainment, anti-social behaviour, school absence frequency, conduct problems, hyperactivity, peer relationship problems and ADHD did not fit the data. An overview of regression models is provided in Table 4.

Does moderate to vigorous physical activity moderate the relationship between school exclusion and health, behavioural and educational outcomes?

Models constructed with BMI ($F^{(9,114)} = 3.70$, $p = .001$, $R^2 = .24$), cognitive word scores ($F^{(9,107)} = 2.22$, $p = .027$, $R^2 = .17$), emotional symptoms ($F^{(9,114)} = 3.37$, $p = .001$, $R^2 = .22$), conduct problems ($F^{(9,114)} = 3.36$, $p = .001$, $R^2 = .22$), hyperactivity ($F^{(9,113)} = 2.82$, $p = .005$, $R^2 = .19$), peer relationship problems ($F^{(9,114)} = 2.99$, $p = .003$, $R^2 = .20$), prosocial behaviour ($F^{(9,114)} = 221$, $p = .026$, $R^2 = .16$), self-esteem ($F^{(9,113)} = 7.92$, $p = .001$, $R^2 = .40$), mental health ($F^{(9,114)} = 3.70$, $p = .001$, $R^2 = .24$) and educational engagement ($F^{(9,116)} = 2.21$, $p = .02$, $R^2 = .16$) as dependent variables fitted the data. Models representing risk-taking behaviour did not fit the data. Prosocial behaviour was not significantly predicted by school exclusion frequency; however,

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TABLE 2 Descriptive statistics and bivariate correlations between variables.

			r^P																
Variable	**M ± *SD***	t^P	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Ex Freq	2.7 ± 3.4	–	–																	
Age	13.8 ± .4	.35	−.00	–																
BMI	21.5 ± 4.1	−5.05	.06	.05***	–															
Word Score	7.1 ± 2.6	11.63***	−11**	.02*	−04***	–														
Risk-taking	.5 ± .1	−7.79***	.13**	−.00	−.03**	−.07***	–													
SDQ-E	2.0 ± 2.1	−9.97	.21**	.02	.10***	−.10***	−.04***	–												
SDQ-C	1.4 ± 1.6	−33.68	.30***	−.00	.08***	−.16***	.07***	37***	–											
SDQ-H	2.9 ± 2.4	−28.08	.25***	−.02*	.03**	−.21***	.12***	.36***	.56***	–										
SDQ-P	1.7 ± 1.8	−14.63	.27***	−.02*	.12***	−.07***	.00	.50***	.37***	.3***	–									
SDQ-PS	8.3 ± 1.8	17.65***	−.15***	−.00	.02*	.04***	−.07***	−.20***	.47***	−.38***	−.31***	–								
ASBO	.3 ± .5	−17.07	.15***	.01	−.00	−.02	.10***	.00	.17***	.16***	.06***	−.13***	–							
SE	15.5 ± 2.8	2.21*	−.00	−.01	−.13***	.02*	.07***	−.23***	−.12***	−.08***	−.12***	.06***	−.05***	–						
SS	8.4 ± .9	7.56***	−.05	.01	−.02*	.04***	−.05***	−12***	−.16***	−.13***	−.16***	.15***	−.13***	.33***	–					
Mood	5.5 ± 5.8	−5.61	.05	.04***	.12***	.02	−.07***	.27***	.16***	.10***	.17***	−.07***	.16***	−.60***	−.37***	–				
Ed Eng	12.5 ± 2.9	−18.09	.10*	.03**	.05***	−.08***	.05***	.18***	.24***	.24***	.12***	−.18***	.24***	−.42***	−.31***	.48***	–			
MVPA'	254.5 ± 124.1	−1.41	.02	−.02	−.04*	−.07***	.03	−.07***	−.00	.07***	−.10***	.05***	.04*	.07***	.03*	−.06***	−.04**	–		
SES	409.8 ± 177.9	19.40 ***	−.15***	.01	−.12***	.26***	−.08***	−.18***	−.24***	−.22***	−.21***	.11***	−.05***	.06***	.10*	−.04***	−.12***	.08***	–	
IMD	5.3 ± 2.9	14.15 ***	−.13***	−.00	−.12***	.19***	.03**	−.14***	−.17***	−.16***	−.16***	.06***	−.03**	.00	.05***	−.01	−.05*	.08**	.54***	–

Abbreviations: ASBO, anti-social behaviour frequency; BMI, body mass index (kg/m^2); C, conduct; E, emotion; Ed Eng, educational engagement; Ex Freq, exclusion frequency; H, hyperactivity; IMD, index of multiple deprivation; M, mean; MVPA', moderate to vigorous physical activity; P, peers; PS, pro-social behaviour; *SD*, standard deviation; SDQ, strengths and difficulties; SE, self-esteem; SES, social economic status; SS, social support; *t*, *t*-test (mainstream school grouping variable).

*$p < .05$, **$p < .01$, ***$p < .001$.

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TABLE 3 Participation in moderate to vigorous physical activity and sport.

	Coefficients				95% CI	
Model	**ß**	**SE**	***t***	**Significance**	**Lower**	**Upper**
MVPA minutes weekday and weekend						
Constant	252.86	1.65	153.26	.001	249.62	256.09
Exclusion (yes)	20.71	9.72	2.13	.033	1.64	39.78
Age	−5.27	3.65	−1.44	.148	−12.43	1.88
SES	.020.01	.01	2.58	.01	.00	.05
IMD	2.40	.64	3.71	.001	1.13	3.66
Gender (male)	22.45	3.27	5.72	.001	16.03	28.87
Sport minutes weekday and weekend						
Constant	159.14	3.89	40.90	.001	151.51	166.78
Exclusion (yes)	−22.36	32.52	−.68	.49	−86.17	41.44
Age	16.26	8.4	1.91	.05	−.32	137.70
SES	−.012	.02	−.45	.65	−.06	.03
IMD	−.62	1.50	−.42	.67	−3.57	2.31
Gender (male)	58.22	7.98	7.29	.001	42.56	73.88

Abbreviations: CI, confidence internal; IMD, index of multiple deprivations; MVPA', moderate to vigorous physical activity; *SE*, standard error; SES, social economic status; *t*, *t*-test (mainstream school grouping variable); *ß*, beta.

a significant interaction term was found between school exclusion and minutes of MVPA (-9.89 ± 3.19, $p = .003$). No other models highlighted a meaningful moderation effect from minutes of MVPA on the relationship between school exclusion and health, behavioural and educational outcomes. Models constructed with sports participation as a dependent variable did not fit the data.

DISCUSSION

The current study aimed to understand the role of MVPA and sports participation in the lives of young people excluded from education. MVPA is often promoted through traditional models of sport-for-development interventions (Sandford et al., 2008). These interventions implemented at a policy and practice level are designed as an all-encompassing solution to a range of behavioural, social, health and educational problems encountered by at-risk young people such as those excluded from education (Sandford et al., 2008). The present study found young people excluded from education meet physical activity guidelines. However, when controlling for social and individual demographic markers, analysis indicates participation in MVPA does not influence predictors of school exclusion or moderate the relationship between school exclusion and health, behavioural and educational outcomes.

Previous analysis drawn from MCS4 data (age 7 years) has highlighted an inverse relationship between predictors of social exclusion such as socio-economic status and participation in MVPA (Biddle et al., 2019). However, no studies to date using cohort data have examined the relationship between school exclusion and MVPA participation. This is important given school exclusion is associated with a range of mental health and psychiatric problems (Tejerina-Arreal et al., 2020), challenges to educational attainment (Parker et al., 2016), behavioural complications (Parker et al., 2016), entrance into the criminal justice system and employability (Gill et al., 2017). Outcomes in which evidence drawn from mainstream education would suggest participation in MVPA can support (Biddle et al., 2019). It, therefore, was important to understand the role school exclusion holds on this modifiable risk factor. The analysis indicates when controlling for SES, multiple deprivation, age and gender, young people participate in 8% more MVPA, but 13% less sport than peers not excluded from education.

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TABLE 4 Impact of moderate to vigorous physical activity on predictors of school exclusion.

	Coefficients				95% CI	
Model	***B***	***SE***	***t***	**Significance**	**Upper**	**Lower**
Mental health and wellbeing						
Constant	7.73	.59	12.97	.001	6.55	8.91
MVPA	.00	.00	.77	.44	−.00	.01
Age	2.25	1.34	1.68	.09	−.40	4.92
Health status	−.06	.56	−1.19	.23	−1.77	.44
Exclusion frequency	.16	.22	.73	.46	−.028	.61
SES	.00	.00	.80	.42	−.00	.01
IMD	.02	.22	.09	.92	−.43	.47
Special educational needs/disability (Yes)	2.92	1.49	1.96	.05	.03	5.88
Gender (Male)	−4.76	1.26	−3.76	.001	−7.26	−2.25
Emotional symptoms						
Constant	2.78	.23	11.76	.001	2.31	3.24
MVPA	−3.88	.00	−.22	.82	−19.33	8.95
Age	.62	.51	1.20	.23	−.00	.00
Health status	−.20	.21	−.93	.35	−.40	1.65
Exclusion frequency	.23	.07	3.37	.001	−.63	.22
SES	2.24	.00	.01	.89	−.00	.00
IMD	.03	.08	.34	73	−.14	.20
Special educational needs/disability (Yes)	1.45	.56	2.55	.01	.32	2.58
Gender (Male)	−1.46	.48	−3.02	.00	−2.42	−.50
Conduct problems						
Constant	3.16	.22	13.94	.001	2.71	3.61
MVPA	9.10	.00	.53	.59	−.00	.00
Age	.63	.51	.53	.59	−.37	1.64
Health status	−.22	.21	−1.05	.29	−.65	.19
Exclusion frequency	.23	.06	3.32	.00	.09	.36
SES	−5.80	.00	−.33	.73	−.00	.00
IMD	−.08	.08	−.95	.34	−.25	.08
Special educational needs/disability (Yes)	1.31	.56	2.33	.02	.19	2.42
Gender (Male)	−.51	.47	−1.06	.28	−1.45	.43
Hyperactivity and inattention						
Constant	5.16	.24	20.77	.001	4.67	5.65
MVPA	.00	.00	.76	.44	−23.77	6.76
Age	.90	.55	1.61	.10	−.02	.00
Health status	−.21	.23	−.89	.37	−.20	2.01
Exclusion frequency	.18	.07	2.38	.02	−.68	.25
SES	7.38	.00	.38	.70	.03	.33
IMD	.01	.09	.14	.88	−.00	.00
Special educational needs/disability (Yes)	2.04	.61	3.32	.00	.82	3.26
Gender (Male)	.77	.52	1.48	.14	−.26	1.81

(Continues)

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TABLE 4 (Continued)

Model	Coefficients		t	Significance	95% CI	
	ß	*SE*			Upper	Lower
Peer relationship problems						
Constant	2.71	.21	12.57	.001	2.25	3.13
MVPA	.88	6.52	.13	.89	−12.04	13.81
Age	.11	.47	.24	.80	−.00	.00
Health status	−.08	.19	−.04	.65	−.82	1.05
Exclusion frequency	.27	.06	4.25	.001	−.48	.30
SES	−.00	.00	−.62	.53	−.00	.00
IMD	.10	.08	1.36	.17	−.04	.26
Special educational needs/disability (Yes)	1.52	.52	2.92	.00	.49	2.55
Gender (Male)	−.24	.44	−.54	.58	−1.12	.63
Educational engagement						
Constant	14.36	.32	44.50	.001	13.72	15.00
MVPA	.00	.00	.72	.47	−.00	.00
Age	1.73	.75	2.32	.02	.25	3.22
Health status	−.15	31	−.51	.61	−.77	.45
Exclusion frequency	.19	.10	1.86	.06	−.01	.39
SES	5.88	.00	.23	.81	−.00	.00
IMD	.06	.12	.55	.58	−.18	.32
Special educational needs/disability (Yes)	2.11	.82	2.56	.01	.47	3.75
Gender (Male)	−1.38	.69	−1.97	.05	−2.76	.00

Abbreviations: CI, confidence interval; IMD, index of multiple deprivation; MVPA', moderate to vigorous physical activity; *SE*, standard error; SES, social economic status; *t*, *t*-test (mainstream school grouping variable); *ß*, beta.

SES and IMD are established independent predictors of MVPA (Biddle et al., 2019) and school exclusion (Tejerina-Arreal et al., 2020). Data within the present study confirms this widespread disparity. Therefore, whilst it was surprising to find that MVPA minutes were greater in young people excluded from education, the findings of the present study are consistent with one evaluation of a small-scale sports-based intervention which found young people educated within a PRU to participate in greater MVPA than UK recommendations (Brinkley et al., 2022). There are several plausible yet complex intrapersonal, interpersonal and environmental mechanisms and relationships which may explain these findings.

To some extent, these warrant further investigation from researchers. Indeed, while within the current study, models predicting did not fit the data, the first of these concerns is ADHD. UK population data indicates young people with ADHD are disproportionately excluded from education (Tejerina-Arreal et al., 2020). ADHD is characterized by impulsive hyperactivity (Dennison et al., 2021), a symptom that perhaps explains the high volume of MVPA captured in young people excluded from education. Good evidence using accelerometery has consistently found MVPA to be higher in young people diagnosed with ADHD (Dennison et al., 2021). While many studies using self-report data do suggest MVPA is lower in young people with ADHD (Dennison et al., 2021), frequently these are measuring modes of activity (e.g., sport) and do not account for objectively captured active count movements. Data within the present study, provides further weight to these arguments. While high levels of MVPA are known to reduce the risk ratio for a range of non-communicable diseases, illnesses and conditions, participation alone in MVPA is not an enriching process associated with the facilitation of life skills, improved resilience, pro-social behaviour and behaviour management (Biddle et al., 2019).

The current analysis suggests young people excluded from education are provided less opportunity to participate in enriching forms of MVPA such as sports. Young people educated in APs such as PRUs

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are typically from the most deprived regions and localities and live in households with disproportionately lower disposable incomes (Tejerina-Arreal et al., 2020). Strong evidence has consistently demonstrated that individuals residing in areas of higher multiple deprivation are provided less accessible community-level opportunities to participate in sports through leisure facilities, club sports and programmes. Moreover, low household income is a known barrier to attendance within club-sport facilities and programmes. Further, APs have great variability over their curriculum, than mainstream schools. Indeed, a recent report (Quarmby et al., 2022) indicated only 78% of APs report physical education (PE) as a compulsory subject across their provision. Moreover, the findings of this report (Quarmby et al., 2022) indicate the facilities, equipment and resources of APs for PE meaningfully challenge delivery. For these reasons, the findings of the present study are concerning. Policymakers and practice stakeholders within education and public health must do more to promote and support participation in sports for young people excluded from education. A plausible avenue for this may be promoted through complex interventions delivered within APs and PRUs which target and are tailored for young people most-at-risk. Evidence indicates these interventions could provide space, funding, facilities and training (e.g., teaching education) and promote and empower pupils' voice in intervention design.

Another plausible avenue and continuing method within policy and practice to intervene in school exclusion through participation in MVPA and sport is through universal opportunities delivered within the community (Coalter, 2012; Sandford et al., 2008). These aim to increase the MVPA of young people often through sports participation (Coalter, 2012; Sandford et al., 2008). Here, or at least policy would suggest, predictors of and outcomes associated with exclusion such as mental health, social and behavioural difficulties, anti-social behaviour and low educational attainment are managed through participation in sport alone (Sandford et al., 2008). However, to date little is known about the function of these MVPA and sporting opportunities on markers and outcomes of exclusion. Interestingly, the current analysis indicates neither meeting recommended levels of MVPA nor sport predicts any marker of exclusion when modelled alongside age, health status, school exclusion frequency, gender, socio-economic status, multiple deprivation and SEND. Moreover, the analysis likewise suggests that participation in MVPA or sport does not moderate the relationship between school exclusion and a range of health, behavioural, social and educational outcomes. Whilst the current study presents the first analysis of this question and is only drawn from one wave of one cohort of data, this finding provides good evidence of the limitation of providing traditional models of sport-for-development or increasing MVPA as a silver bullet within policy and practice. This analysis provides evidence to reinforce arguments within the literature regarding the limitations of traditional forms of sport and MVPA as a vehicle for change (Coalter, 2012; Sandford et al., 2008).

However, these findings must be considered in context. Foremost, it remains unlikely that the promotion of MVPA or sport will change within the UK or global policy. For this reason, it remains important to critically consider how sport could be promoted. For example, understanding how the social setting within sports could serve as a foundation for a range of educational, behavioural and therapeutic interventions may be a useful step. While these interventions have demonstrated efficacy, they have not yet achieved treatment and social acceptability for addressing school exclusion (Valdebenito et al., 2018). Future research may consider the application of promotion models which merge sport within efficacy-rich workshops, education and therapy.

Strengths and limitations

The current study presents the first analysis of data which explores the complex relationship between participation in MVPA or sport and school exclusion. This should be highlighted as a strength of the study. The analysis unpicks the effectiveness of commonplace policy and practice within the UK. The study does, however, have limitations. Foremost, the study presents only analysis drawn from the MCS and one wave (MCS6) of this established birth cohort. Future research may wish to examine the questions posed in the present study within other UK birth cohorts such as the AVON study and population datasets (e.g., Active Lives) or samples drawn from differing countries. Moreover, some internal consistency

values reported within the study fall below an acceptable range (i.e., strengths and difficulties, self-efficacy). A further limitation of the present study and MCS is the measurement of MVPA and sport. While the MCS does randomly select a week and weekend day for participants to wear an accelerometer or complete MCS, this assumes that this data collection provides a true representation of physical activity behaviour. Notwithstanding, the MCS does provide a clear source of MVPA data. Finally, the sample of young people who were excluded from education and who completed a TUD (i.e., the measure of sports participation) was particularly small and represents only one point in time. Further research is still required to clarify the role of sport in the lives of young people excluded from education over the long term.

CONCLUSION

Participation in MVPA (e.g., sport) is a foundation of a range of policy and practice-level interventions designed to improve the health, behaviour, wellbeing and educational attainment of at-risk young people (Coalter, 2012). For young people excluded from education, this is no exception. The evidence base for this, despite widespread adoption is weak. The present study addresses questions relating to the participation of excluded young people within the UK, and the impact of engagement on predictors and outcomes associated with exclusion. The findings of the present study indicate young people participate in greater levels of MVPA than young people who were not excluded from education. Findings also highlight the disparity in sports participation which may be explained by a lack of opportunity. Neither MVPA nor sports participation held any meaningful impact on predictors of or outcomes associated with school exclusion. This finding raises questions on the role of MVPA and sport alone as a silver bullet within UK policy and interventions designed to prevent and manage exclusion. Future research should seek to understand the impact of these policies and interventions over the long term.

AUTHOR CONTRIBUTION

AB conducted a secondary analysis of the MCS6 data. AB produced the final article.

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CONFLICT OF INTEREST STATEMENT

The author declares no competing interests.

DATA AVAILABILITY STATEMENT

Data were drawn from the sixth wave of the Millennium Cohort Study (MCS6). The datasets generated during and/or analysed during the current study are available in from the UK Data Service (https://ukdataservice.ac.uk/).

ORCID

A. J. Brinkley https://orcid.org/0000-0002-5688-3880

TWITTER

A. J. Brinkley andybrinkley

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