

# To persist or not? Examining the relations between parental education, self-regulation, school engagement and persistence in post-compulsory education

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## Abstract

There are few longitudinal studies of adolescent students' choice to persist in post-compulsory education. Hence, the present study introduces a longitudinal model that describes the interplay between sociological and psychological explanations of adolescents' choice to persist in post-compulsory education in the UK. Data on parental education, early childhood self-regulation (age 5), sustained school engagement (ages 7, 11, 14) and persistence in education after the end of compulsory schooling (age 17) were utilised. The sample comprised 8333 (51.1% females, 89.5% white) children from the Millennium Cohort Study. Statistical analyses included state–trait modelling, longitudinal mediation and multigroup moderation. A trait–state–occasion model was run to disentangle the trait from state variance in school engagement. Afterwards, two hypotheses were formulated, namely the 'instilment' and the 'differential'. The 'instilment' hypothesis involved a longitudinal predictive model, whereby parental education predicted early childhood self-regulation which, in turn, predicted sustained school engagement which predicted students' choice to persist. The 'differential' hypothesis examined whether higher vs. lower parental education changed the nature of the predictive relations between self-regulation, sustained school

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engagement and persistence. The results were in favour of an 'instilment' hypothesis, whereby higher parental education was translated to higher levels of early self-regulation which predicted higher sustained engagement, which, in turn, predicted greater probability of persisting in post-compulsory education. The findings suggest a pathway from early childhood experiences to educational outcomes via the development of a trait of engaging with school.

#### **KEYWORDS**

longitudinal study, millennium cohort study, persistence in education, school engagement, self-regulation

### **Key insights**

#### **What is the main issue that the paper addresses?**

The paper proposed and tested two conceptual models explaining late adolescents' choice to persist in further education at age 17 years. The role of parental education, childhood self-regulation and school engagement as robust predictors of adolescents' choice to persist in education was examined.

#### **What are the main insights that the paper provides?**

The analyses of representative UK data revealed that the beneficial effects of early childhood self-regulation on persistence were completely transmitted through holding sustained school engagement (ages 7, 11 and 14 years). Higher (vs. lower) parental education did not moderate the mechanisms predicting adolescents' choice to persist in post-compulsory education.

## **INTRODUCTION**

In the UK, most adolescents choose to remain in education after compulsory schooling has ended, rather than transition to employment or become not in education, employment or training (Symonds, Dietrich, et al., 2016). Continuing in education even after there is the option to leave and completing education programmes after this point have been linked with multiple long-term advantages in terms of better health outcomes (Montez & Friedman, 2015), access to tertiary education and better labour market prospects (OECD, 2019). Hence, it is important to increase our understanding of the social and psychological characteristics of the adolescents who persist in post-compulsory education.

Standard sociological approaches are to some extent deterministic since their basic reasoning is that adolescents' decision to persist in post-compulsory education is linked to the socio-economic position of the families (Díaz-Vicario et al., 2019; Otero, 2007; Thompson & Simmons, 2013). These approaches focus more on the structural determinants of persisting in post-compulsory education than on agentic psychological processes that could

explain why many adolescents choose to remain in post-compulsory education (Schoon & Heckhausen, 2019).

Hence, in the present study we extend this traditional sociological viewpoint to also consider psychological mechanisms that, despite being partially influenced by the socio-economic position of the adolescents' families, could be a helpful heuristic to explain subject-to-change processes that underpin the choice to persist in post-compulsory education. This psychological mechanism involves a longitudinal prediction from early self-regulation (a temperament trait-age 5) to sustained school engagement (trait-level across ages 7, 11 and 14), to persistence in post-compulsory education (age 17). The specifics of this mechanism are presented in the sections below.

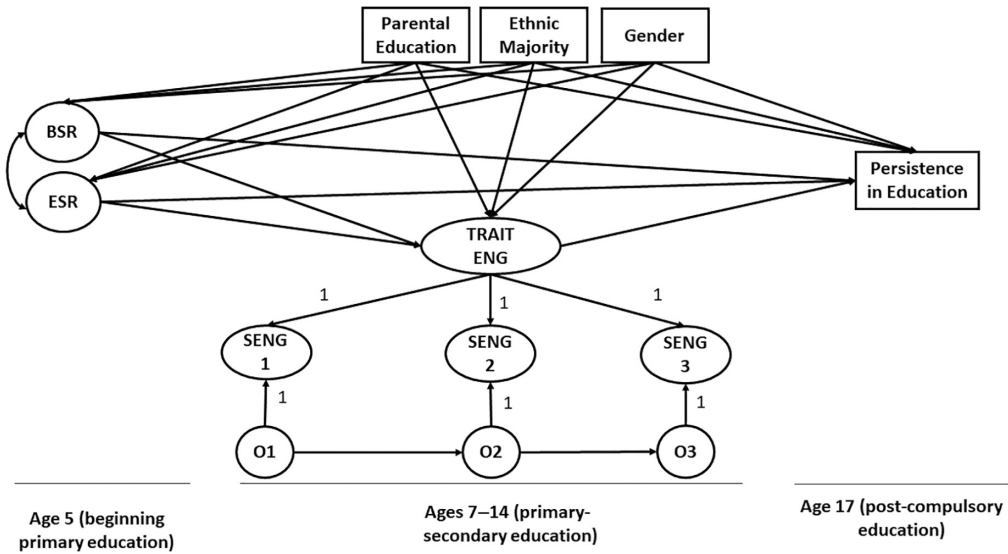
Sociological literature has long highlighted inequalities in children's school performance as an indication of differing child engagement with education along class-cultural lines (e.g. Connell et al., 1995). Employing Pierre Bourdieu's cultural capital theory, such conceptualisations hypothesise that children from lower socio-economic backgrounds exhibit lower engagement with education owing to a disconnect between their working-class cultural capital and the cultural capital requirements valued by the education system (de Moll et al., 2023; Gillies et al., 2010; Tramonte & Willms, 2010).

Cultural capital explanations have been criticised as positing socially deterministic and unnecessarily convoluted explanations for observed socio-economic differences in child engagement and persistence in education (Goldthorpe, 2007), with research indicating that inequalities in resources, not culture, are the predominant driving force behind the observed inequalities (Sullivan, 2007). Alternatively, the effect of socio-economic background could manifest itself on child engagement via psycho-social mechanisms such as those mechanised in the family stress model, whereby a household's experiences of financial strain affect children psychologically, resulting in children engaging less effectively with their educational activities (Conger & Donnellan, 2007; Masarik & Conger, 2017).

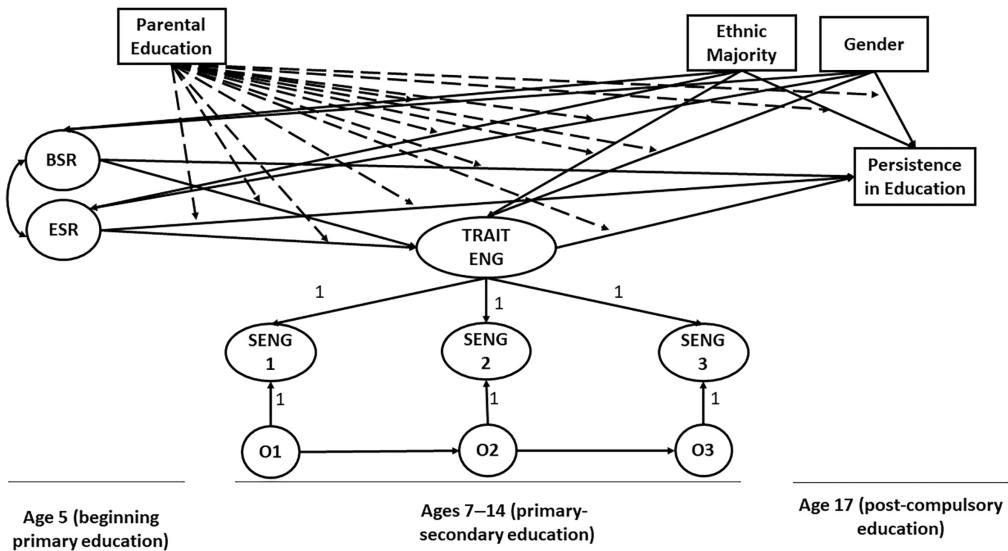
While children and households might not hold an inherent detachment from education, as would be posited by cultural capital theory, it could instead be that children from lower socio-economic households are more readily exposed to stressful psycho-social processes (Masarik & Conger, 2017). Therefore, we need to construct complex longitudinal models describing the interplay between agentic psychological mechanisms that, despite being susceptible to socio-economic influences, can promote adolescents' choice to persist in post-compulsory education above and beyond the social influences (Schoon & Heckhausen, 2019). Such mechanisms could involve both early self-regulation and sustained school engagement as shown in [Figures 1 and 2](#).

One behavioural phenomenon which might be expected to influence persistence in post-compulsory education is self-regulation. Self-regulation is a broad construct constituting multiple dimensions regarding the modification, moderation or inhibition of behavioural, cognitive and affective actions and reactions towards the satisfaction of individual goals or desires or the avoidance of unwanted outcomes (Duckworth & Carlson, 2013; McClelland et al., 2015). Within the context of formal schooling, self-regulation plays a key role in influencing both educational achievement and attainment. The empirical literature indicates that self-regulation impacts academic performance (Duckworth et al., 2010; Duckworth & Seligman, 2005) and (when measured in early childhood) increases the probability of remaining in further education up to the age of 25 (McClelland et al., 2013). Likewise, children who struggle with self-regulation are placed at an educational disadvantage from an early age, the personal and economic consequences of which can persist well into adulthood (Schoon et al., 2021).

Despite the potential benefits of early self-regulation for persistence in education, it is unreasonable to assume that its effect is only a direct one since other factors may intervene during the course of development. One such factor that may explain the link between



**FIGURE 1** Conceptual model representing the ‘instilment’ hypothesis (mediation model). BSR, Behavioural self-regulation; ESR, emotional self-regulation; O1, transient school engagement in primary school (age 7); O2, transient school engagement in primary school (age 11); O3, transient school engagement in secondary school (age 14); SENG1, state school engagement in primary school (age 7); SENG2, state school engagement in primary school (age 11); SENG3, state school engagement in secondary school (age 14); TRAIT ENG, stable/sustained school engagement.



**FIGURE 2** Conceptual model representing the ‘differential’ hypothesis (moderation model). BSR, Behavioural self-regulation; ESR, emotional self-regulation; O1, occasion-specific school engagement in primary school (age 7); O2, occasion-specific school engagement in primary school (age 11); O3, occasion-specific school engagement in secondary school (age 14); SENG1, state school engagement in primary school (age 7); SENG2, state school engagement in primary school (age 11); SENG3, state school engagement in secondary school (age 14); TRAIT ENG, stable/sustained school engagement.

self-regulatory abilities in early childhood and school persistence in post-compulsory education in late adolescence is school engagement. School engagement is typically defined as emotional, affective or behavioural commitment and investment in educational

practices (Fredricks et al., 2004). In the present study, we focus only on emotional and behavioural aspects of school engagement. Emotional engagement encompasses students' positive and negative affective reactions to the school, the class, whereas behavioural engagement reflects students' behavioural conduct, effort and active participation in class (Fredricks et al., 2019). All components of engagement are aided by self-regulation in its basic form as top-down control over behaviour (Carver & Scheier, 2016; Cleary & Zimmerman, 2012).

Indeed, most conceptual models addressing such a relationship highlight the necessity of good self-regulatory practices for producing persistent school engagement through the ability to self-moderate temperament or reduce distractibility (Liew et al., 2019). However, students' school engagement can be considered an agentic force encapsulating students' active involvement in the school environment (Reeve & Jang, 2022). This suggests that students can be proactive in their learning environments. Additionally, students' engagement has been described as a protective factor that buffers negative outcomes and assists with students' resilience (Skinner & Pitzer, 2012). Therefore, school engagement can be more malleable to change compared with students' self-regulation skills, which are considered a relatively enduring aspect of temperament (Willems et al., 2019).

Studies on school dropout have shown that school engagement is a crucial factor that helps students to remain in school (Fall & Roberts, 2012; Wang & Fredricks, 2014). However, there is a paucity of studies on the links between sustained (trait-level) school engagement and persistence in post-compulsory education. A few extant studies exploring this relationship have shown that early school engagement is predictive of persisting in post-compulsory education indexed by attaining greater educational levels in adulthood (Abbott-Chapman et al., 2014; Symonds et al., 2022). Nevertheless, these studies are limited since they included measures of school engagement in a specific timepoint and could not decompose engagement into transient and stable/trait components. Additionally, school engagement should not be measured in a situational vacuum, as the state–trait theory would suggest (Steyer et al., 2015), since adolescents may have a history of engaging and disengaging with school to some extent.

Theoretical models indicate the critical role early self-regulation plays in fostering children's engagement with school-related activities (Blair & Raver, 2015; Eisenberg et al., 2010). Nevertheless, there is surprisingly little empirical research on the links between children's self-regulation and school engagement (Eisenberg et al., 2010), leaving the possibility that early childhood self-regulatory skills manifest themselves from middle childhood to mid-adolescence via school engagement largely underresearched. A few empirical studies suggest that higher levels of self-regulation are connected to higher school engagement (Jahromi et al., 2013; Stefansson et al., 2018).

However, these studies, perhaps owing to their limited time-span, leave unexplored the potential links of self-regulation with sustained school engagement throughout the primary and secondary school years, and subsequent persistence in post-compulsory education. Thus, this study aims to address this issue.

In addition to the above, in this study, we take into account the socio-economic position of the adolescents as a predictor of self-regulation, school engagement and the choice to persist in post-compulsory education. Specifically, we consider the educational background of the primary caregiver as the indicator of the socio-economic position of the children since parental education tends to be more invariant over time (Haveman et al., 2004) and has greater impact on the development of children's educational outcomes compared with income (Crosnoe, 2012). However, the evidence on links between parental education differentials, self-regulation and sustained school engagement remains inconclusive. Although self-regulation, as an aspect of temperament (Bridgett et al., 2015), can be considered a trait-level construct by definition, school engagement may oscillate during the early school



years. That does not mean, however, that both self-regulation and sustained school engagement are not susceptible to socio-economic influences.

Debate continues as to how sensitive these self-regulatory and engagement processes are to social influences. Some evidence has come to light indicating that parental education level (i.e. a proxy of socioeconomic status) was associated with better child self-regulation (Duncan et al., 2017; Lenes et al., 2020; Sektnan et al., 2010). Nevertheless, other studies reported no statistically significant effect of parental education on self-regulation (Gestsdottir et al., 2014). Similarly, some evidence points towards positive associations with school engagement (Abbott-Chapman et al., 2014; Symonds et al., 2022), while other studies report no such associations (Cadima et al., 2015; Symonds, Schoon, et al., 2016).

A point that may be neglected in such research is the developmental changes that occur between childhood and adolescence. Adolescence is a stage of increased independence and individuation, and as such is sometimes associated with a greater risk of decline in school-based activities and an increase in school disengagement (Skinner & Pitzer, 2012; Wang & Fredricks, 2014). School disengagement in adolescents is typically associated with rises in problematic externalising behaviours (Skinner & Pitzer, 2012). However, such declines in engagement are not universally observed and some groups of adolescents may be at greater risk than others (Katsantonis, 2024), particularly those that lack the encouragement from parents or those households that do not have the resources or time to address challenging developmental behavioural changes (Salmela-Aro et al., 2021).

## The present study

In this study, we go beyond deterministic explanations and explore the extent to which students' prolonging of education beyond compulsory schooling reflects self-regulatory skills in early childhood and school engagement in middle childhood to mid-adolescence, above and beyond socio-economic differences. In England, when adolescents reach the age of 16 years, they can choose to remain in school or college for further education until age 18 or they can start an apprenticeship, traineeship or study part-time whilst spending 20 h or more on volunteering or working (<https://www.gov.uk/when-you-can-leave-school>). In contrast, adolescents can leave school after age 16 years in Scotland, Northern Ireland and Wales (<https://www.gov.uk/when-you-can-leave-school>). However, school or college non-attendance might also reflect regional differences in young people not in education, employment or training policies. Hence, using longitudinal data from the British (data come from England, Scotland, Wales and Northern Ireland) nationally representative Millennium Cohort Study, we explored the mediating role of sustained (trait-level) school engagement in the relation between early childhood self-regulation and late adolescent decision to persist in education.

Our overarching research question queried whether sustained student engagement mediated the connection between self-regulation in early childhood and continuation of formal education in late adolescence. Here, we anticipated that adolescents' educational trajectories were largely determined by individual ability to engage in schooling which develops across the life course as a competence that channels social and environmental resources to individuals (Symonds et al., 2022).

Our hypotheses tested how parental education, acting as an indicator of socioeconomic background, impacted this process. Firstly, we hypothesised that differences in parental education backgrounds/levels would directly impact levels of self-regulation, sustained school engagement and persistence in post-compulsory education. In this sense, parental education would be '*instilled*' in the developmental process ('*instilment*' hypothesis). Secondly, we tested an alternative explanation such as that the proposed

TABLE 1 Descriptive statistics and error-free latent correlations-confirmatory factor analysis model.

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender	1									
2. Behavioural self-regulation age 5	0.17***	1								
3. Emotional self-regulation age 5	0.11***	0.45***	1							
4. Sustained school engagement <sup>a</sup>	0.25***	0.30***	0.40***	1						
5. Ethnic majority	-0.01	0.05*	0.05	-0.12*	1					
6. Edu 1	-0.02	-0.04*	-0.09***	-0.02	0.11***	1				
7. Edu 2	0.02	0.01	0.05**	0.05	0.02	-0.30***	1			
8. Edu 3	-0.01	0.08***	0.19***	0.02	0.02	-0.64***	-0.27***	1		
9. Edu 4	0.00	-0.02	-0.05***	0.02	-0.16***	-0.12	-0.05	-0.11	1	
10. Persistence in education age 17	0.01	0.04***	0.11***	0.23***	-0.03*	-0.07***	0.02	0.11***	0.00	1
Descriptive statistics										
Mean (SD)	1.51 (0.06)	19.41 (2.13)	18.56 (2.14)	0 (0.26)	1.28 (0.91)	0.41 (0.49)	0.11 (0.31)	0.37 (0.48)	0.02 (0.00)	0.92 (0.27)
Percentage of maximum	51.69	0.05	0.03	—	1.44	89.5	11.03	34.57	2.85	92.2
Min–Max	1–2	10–27	10–27	—	0–1	0–1	0–1	0–1	0–1	0–1

Abbreviations: Edu 1, secondary education; Edu 2, A levels; Edu 3, higher education certificate/diploma/foundation degree; Edu 4, overseas qualification; ethnic majority, white; gender, female vs. male; max, maximum possible value; min, minimum possible value; —, not applicable owing to latent factor structure.

<sup>a</sup>This is a latent variable with a latent mean of zero and freely estimated variance.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

process would not be invariant across students coming from higher and lower parental education backgrounds. This '*differential*' hypothesis assumes that school engagement as a form of agency will be more impactful for children from families with greater household resources. These hypotheses are tested through a longitudinal mediation model and a moderated mediation model. The two conceptual models are presented in [Figures 1](#) and [2](#).

## METHOD

### Data and participants

Data come from the Millennium Cohort Study (MCS) that follows the lives of a nationally representative sample of children born in 2000 in the UK (CLS, [2017](#); University of London, Institute of Education, Centre for Longitudinal Studies, [2023](#)). Similar to previous studies with this dataset (Reed et al., [2023](#)), a balanced panel was constructed so that each participant would have had equal contribution to all parameters. Hence, the sample of the present study comprised 8333 children, who were interviewed along with their families in each wave of the cohort study from age 5 to age 17. These participants had participated in all the waves of the survey (wave 3, 4, 5, 6, 7) that were pertinent for the purposes of the present study. Full description of the sample's core characteristics is provided in [Table 1](#).

### Measures

#### Self-regulation: Behavioural regulation and emotional regulation

The children's parents at age 5 completed the two subscales of the Children's Social Behaviour Questionnaire (Johnson et al., [2015](#); Melhuish et al., [2004](#); Sammons et al., [2004](#)). The subscales available at age 5 (wave 3) covered the domains of independent behavioural self-regulation (BSR) and emotional dysregulation (ESR). Each scale comprised five items (Johnson et al., [2015](#)). The response format was a three-point scale ranging from 1, 'not true' to 3, 'certainly true'. Sample items for the BSR and ESR scales include 'likes to work things out for self' and 'shows mood swings', respectively. The emotional dysregulation items were reverse-scored so that higher scores correspond to greater emotional self-regulation. Emotional and behavioural self-regulation were treated as latent factors, each with five indicators. Both the behavioural self-regulation and the emotional self-regulation scales had reasonably good reliability according to McDonald's omega total coefficients,  $\omega_{\text{tot}} = 0.66$  and  $\omega_{\text{tot}} = 0.73$ , respectively.

#### School engagement

The school engagement scale comprises of four items in waves 4 (age 7), 5 (age 11) and 6 (age 14). These items cover both the affective component ('how often do you feel unhappy at school?') and the behavioural component ('how often do you try your best at school?') of engagement. The current scale is a global measure of school engagement that is typically encountered in longitudinal works (Salmela-Aro et al., [2021](#)). The possible item responses ranged between 1 'never' to 4 'all of the time' in waves 5 and 6, whereas they ranged from 1 'never' to 3 'all of the time' in wave 4. Appropriate recoding was performed such that higher scores would reflect greater school engagement. School engagement on each occasion



was modelled as a latent factor with four indicators. On each occasion, the scale had good reliability according to McDonald's omega total coefficient ( $\omega_1 = 0.59$ ,  $\omega_2 = 0.80$ ,  $\omega_3 = 0.77$ ).

## Persistence in post-compulsory education

Students' persistence at school was measured at age 17 (wave 7), when children usually finish compulsory secondary education in the UK (Symonds, Dietrich, et al., 2016). Persistence in education was measured through a binary variable asking late adolescents whether they were still studying in school or college (yes = 1).

## Parental education

The interviewed parent's (mainly natural mothers) highest educational qualification level at age 5 (wave 3) was utilised as a measure of parental education. The MCS provided an equivalised measure of parental education, which reflected all educational changes across the preceding waves. Parental education (PARED) was coded using the UK's National Vocational Qualification system (NVQ), which in the present study ranged from 1 to 5 with separate categories for overseas qualifications and the option 'none of the above'. The 'none of the above' category was used as the reference value. In the recoded variable, levels 1 and 2 indicate graduation from compulsory secondary education, whereas level 3 indicates a graduate of post-compulsory education with certificate of national exams (A levels), among others. The NVQ level 4 corresponds to a higher education diploma, while level 5 indicates a holder of a higher education diploma/foundation degree.

## Ethnicity

Each student participant's ethnicity was coded based on the UK Census' six category classification at age 5 (wave 3). Ethnicity was recoded to reflect the ethnic majority group (white = 1).

### *Gender*

A binary variable coding whether the students were female vs. male.

## Ethical consideration

Each wave of the MCS has received full ethical approval from the London Multi-Centre Research ethics committee [MREC/03/2/022; 05/MRE02/46; 07/MRE03/32; 11/YH/0203; 13/LO/1786 17/NE/0341]. Informed consent was obtained and the children consented to participate.

## Statistical analyses

Preliminary analyses of the missing data patterns were conducted followed by analyses of construct validity through confirmatory factor analysis (CFA). A longitudinal CFA model was specified and tested to ensure construct validity for school engagement and a CFA was deployed to test the construct validity of self-regulatory skills. Accounting for the common

method variance owing to common wordings (Cole, 2012; LaGrange & Cole, 2008), an autocorrelated factor structure with autocorrelated residuals (Bandalos, 2021) was specified for school engagement. Afterwards, a latent trait–state–occasion model (see Figure 3) was estimated to disentangle trait- and occasion-specific variance from the school engagement construct (Cole et al., 2005; Geiser et al., 2021; Katsantonis & McLellan, 2023; Prenoveau, 2015, 2016). The trait–state–occasion model is similarly configured to the random intercept cross-lagged panel model (Hamaker et al., 2015) with the exception that there is no second construct.

Afterwards, we estimated models with direct effects only to determine whether the variables in isolation were predictive of persistence in post-compulsory education. Finally, the full conceptual model was tested (Figure 1). To test the moderated mediation hypothesis of higher parental education (i.e. Edu 3) vs. lower parental education on the full longitudinal mediation model, we deployed the multigroup approach (Holmbeck, 1997; Katsantonis, 2021; Sass & Schmitt, 2013). However, modifications were required owing to the latent trait–state–occasion component of the model. To this end, we overrode the default factor analysis constraints and constrained all latent factor means to zero in the last group (higher parental education) to achieve model identification (see Mulder & Hamaker, 2021).

Structural equations were estimated in *Mplus* 8.7 (Muthén & Muthén, 2017), while preliminary data management was performed using Stata 16 (StataCorp, 2019). Reliability coefficients were computed based on polychoric correlations using the *psych* package (Revelle, 2022) in the statistical language *R* (R Core Team, 2020). Since the item-level data and the outcome were measured using ordinal/binary response formats, the models were estimated using polychoric correlation matrices with the Weighted Least Squares Mean and Variance adjusted (WLSMV) estimator (Rhemtulla et al., 2012). Owing to missing data on key outcomes and covariates, a Bayesian multiple imputation with Markov Chain Monte Carlo was performed in *Mplus* where all the variables above were entered into the imputation model (Enders, 2022). Given the fraction of missing information

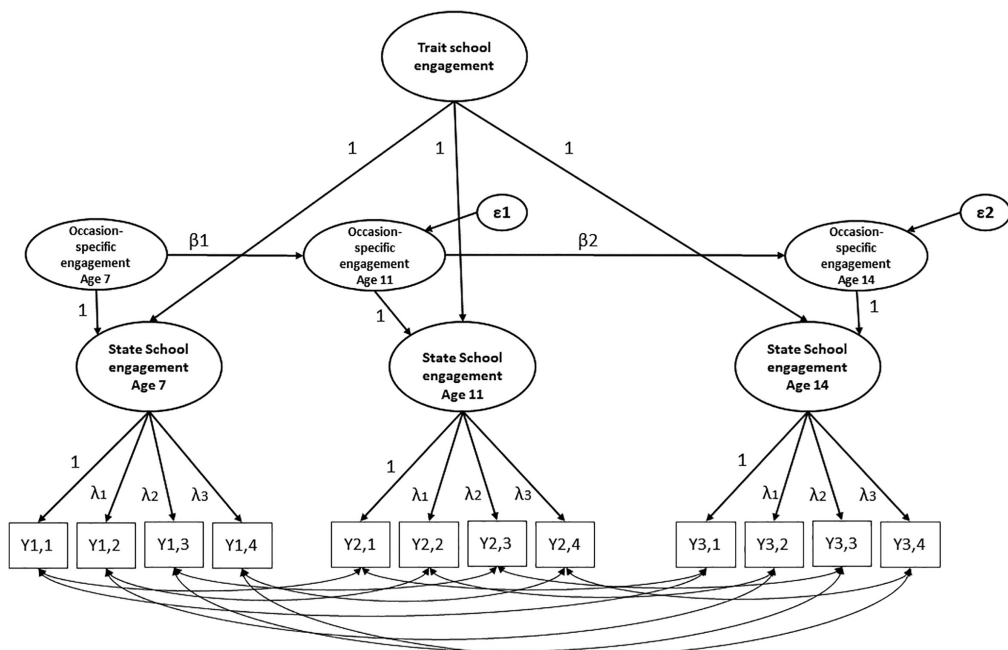


FIGURE 3 Multivariate latent trait–state–occasion model of school engagement.

coefficients below 0.3, 40 imputed datasets were generated and analysed, as considered appropriate (Graham et al., 2007). The resulting estimates and standard errors were averaged across datasets using Rubin's (2004) rules to account for between-imputation variance.

The conventionally accepted values in the goodness-of-fit indices were utilised to inspect the degree of model-data fit. As such, values close to 0.95 in the comparative fit index (CFI) and Tucker–Lewis index (TLI) along with values less than 0.06 in the root mean square error of approximation (RMSEA) and the standardised root mean residual (SRMR) were considered acceptable (Hu & Bentler, 1999). Indirect effects were tested using the Model Indirect command in *Mplus*. Comparisons between the fully constrained moderated mediation models and the unconstrained models were conducted through the DIFFTEST procedure for the WLSMV estimator (Asparouhov et al., 2006; Asparouhov & Muthén, 2010). Finally, the sampling weight at age 17, clustering and stratification information were incorporated in the modelling to adjust the standard errors for the complex sampling design (TYPE = COMPLEX).

## RESULTS

### Descriptive statistics and bivariate correlations

In the first instance, bivariate latent correlations and descriptive statistics for the key outcomes and covariates are presented in Table 1.

### Preliminary analyses

#### Missing data analysis

A missing data analysis was performed to determine the extent to which missing values occurred on the key variables of interest in the longitudinal dataset. Inspection of the missing data patterns revealed 21% of missing values in the measures of the school engagement, self-regulation, and the outcome. Little's MCAR test reached statistical significance, Little's  $\chi^2(4033) = 5190.16$ ,  $p < 0.001$ , indicating that the data were not missing completely at random. Thus, we tested the hypothesis that the data were missing conditionally on the sociodemographic study variables of parental education, ethnic majority and gender. This test confirmed that parental education and ethnicity significantly predicted the patterns of missing data, Little's  $\chi^2(27,755) = 10,680.81$ ,  $p > 0.05$ .

#### Construct validity testing

Afterwards, the data were subjected to CFAs. A few residual correlations were introduced to improve the model fit of marginally misspecified measurement models owing to meaning and order method effects. The longitudinal CFA for school engagement indicated good fit to the data, scaled  $\chi^2(42) = 205.93$ ,  $p < 0.001$ , CFI = 0.99, TLI = 0.98, RMSEA = 0.02, SRMR = 0.02. Similarly, a single latent factor model of behavioural self-regulation exhibited good fit, scaled  $\chi^2(2) = 8.33$ ,  $p < 0.05$ , CFI = 1.00, TLI = 0.99, RMSEA = 0.02, SRMR = 0.01. In the same vein, the single-factor CFA model for emotional self-regulation had a good fit, scaled  $\chi^2(3) = 11.86$ ,  $p < 0.05$ , CFI = 1.00, TLI = 1.00, RMSEA = 0.02, SRMR = 0.01. These results indicate that school engagement, behavioural self-regulation and emotional self-regulation exhibited good internal structure validity.

## Latent trait–state–occasion modelling

Following the construct validity analyses, trait–state–occasion modelling was deployed, whereby we introduced a random-intercept by constraining the latent factor loadings to unity (see Figure 3). The *trait–state–occasion* model reached very good fit, scaled  $\chi^2(42) = 207.018$ ,  $p < 0.001$ , CFI = 0.99, TLI = 0.98, RMSEA = 0.02, SRMR = 0.02. The modelling revealed that school engagement was more fluctuating rather than stable over time. Twenty-four per cent of the variance of school engagement in early primary school was explained by the latent trait factor, whereas the proportion of variance explained by the latent trait in the last year of primary school was 15% at age 11 and 18% at age 14 (secondary school). Regarding the within-person occasion-specific changes in school engagement, we found weak to moderate within-person stability of school engagement in primary school (from age 7 to 11),  $\beta = 0.21$  (SE = 0.05),  $p < 0.001$ , and between primary school (age 11) and secondary school (age 14),  $\beta = 0.36$  (SE = 0.04),  $p < 0.001$ .

## Self-regulation, school engagement and educational persistence: Parental education instilment hypothesis

Having disentangled the variance components in school engagement, we proceeded to model the longitudinal relationship between self-regulatory skills and remaining in education. Firstly, we specified a model (Model I) where we estimated the direct effect of parental education on persistence in school adjusting for ethnicity. In this model, the direct effects of parental education reached statistical significance,  $p < 0.05$ .

Adjusting for the effects of parental education and ethnicity at age 5, a model (Model II) was tested with direct effects flowing only from the latent behavioural self-regulation and emotional self-regulation at age 5 (beginning primary school) to remaining in school/college at age 17 (post-compulsory education). The recovered parameter estimates indicated that only emotional self-regulation had a statistically significant direct effect on late adolescents' persistence in education,  $\beta = 0.15$ ,  $p < 0.001$ .

Continuing our model-building, an alternative Model III was specified to estimate the impact of parental education on sustained (trait) school engagement in the prediction of educational persistence without emotional self-regulation and behavioural self-regulation. Model III indicated that higher parental education was linked to greater sustained school engagement in the absence of self-regulation.

In the final model (Model IV), we introduced the decomposed school engagement as a mediating mechanism between self-regulatory skills and educational persistence, adjusting for ethnicity, parental education background and child gender. The structural equation model reached a very good level of fit to the data, as can be seen in Table 2.

The parameter estimates from the longitudinal structural equation models are presented in Table 2. Sustained school engagement transmitted the effects of children's self-regulatory skills at age 5 to educational persistence at age 17. In fact, the model indicated a full mediation effect between emotional self-regulation and educational persistence at age 17, while behavioural self-regulation exerted only a statistically significant indirect effect on late adolescent students' educational persistence via school engagement. In other words, school engagement 'absorbed' the influence of emotional self-regulation and transmitted the effect of behavioural self-regulation on late adolescents' educational persistence. Like Model II, the full longitudinal model indicated that higher levels of parental education at age 5 predicted higher levels of self-regulatory skills at age 5 and educational persistence at age 17.

Although higher parental education was not directly related to higher sustained school engagement during primary and secondary education in Model IV, it was indirectly related

**TABLE 2** Standardised parameter estimates of the longitudinal modelling.

Dependent	Predictor	Model I				Model II				Model III				Model IV				Model V <sup>b</sup>			
		<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	<i>B</i> Estimate (SE)	
Persistence <sup>a</sup>	School engagement																				
	Behavioural self-regulation																				
	Emotional self-regulation																				
	Edu1	0.14 (0.035)***	0.11 (0.035)***	0.10 (0.034)***	0.10 (0.033)***	0.36 (0.049)***	0.35 (0.059)***	0.34 (0.059)***	0.33 (0.053)***												
	Edu2	0.17 (0.030)***	0.14 (0.030)***	0.13 (0.032)***	0.12 (0.031)***																
	Edu3	0.36 (0.041)***	0.30 (0.040)***	0.31 (0.043)***	0.30 (0.042)***																
	Edu4	0.04 (0.023)	0.04 (0.024)	0.03 (0.024)	0.033 (0.024)																
	Ethnic majority	-0.08 (0.023)***	-0.09 (0.023)***	-0.02 (0.027)	-0.02 (0.030)																
	Gender	0.03 (0.025)	0.02 (0.026)	-0.04 (0.028)	-0.03 (0.027)																
	Behavioural self-regulation	Edu1																			
Edu2																					
Edu3																					
Edu 4																					
Ethnic majority																					
Gender																					
Edu 1																					
Edu 2																					
Emotional self-regulation	Edu 3																				
	Edu 4																				
	Ethnic majority																				
	Gender																				
	Edu 1																				
	Edu 2																				
	Edu 3																				
	Edu 4																				

(Continues)

TABLE 2 (Continued)

Dependent	Predictor	Model I	Model II	Model III	Model IV	Model V <sup>b</sup>	
		B Estimate (SE)	B Estimate (SE)	B Estimate (SE)	B Estimate (SE)	Higher PARED B Estimate (SE)	Lower PARED B Estimate (SE)
School engagement	BSR				0.11 (0.038)***	0.09 (0.035)***	0.10 (0.038)***
	ESR				0.29 (0.043)***	0.28 (0.036)***	0.29 (0.043)***
	Edu 1			0.10 (0.040)*	0.03 (0.038)		
	Edu 2			0.12 (0.035)***	0.04 (0.035)		
	Edu 3			0.14 (0.041)***	0.00 (0.042)		
	Edu 4			0.03 (0.023)	-0.02 (0.023)		
Ethnic majority				-0.16 (0.025)***	-0.18 (0.026)***	-0.15 (0.022)***	-0.15 (0.024)***
	Gender			0.21 (0.028)***	0.15 (0.026)***	0.15 (0.025)***	0.15 (0.025)***
N		8333	8333	8333	8333	2849	5201
Scaled $\chi^2$ (d.f.)		0.00 (0.00)	893.422 (84)***	760.809 (119)***	1475.103 (321)***	1480.350 (549)***	
CFI		1.00	0.93	0.94	0.93	0.95	
RMSEA		0.00	0.034	0.025	0.021	0.02	
SRMR		0.001	0.045	0.049	0.045	0.05	
Pseudo-R <sup>2</sup>		0.07	0.09	0.19	0.19	0.13	0.12

Note: Overseas qualifications category was dropped from the moderated model; standard errors in parentheses; pseudo-R<sup>2</sup> refers to variance explained in educational persistence.

Abbreviations: BSR, Behavioural self-regulation; CFI, comparative fit index; d.f., degrees of freedom; Edu 1, secondary education; Edu 2, A levels; Edu 3, higher education certificate/diploma/foundation degree; Edu 4, overseas qualification; ESR, emotional self-regulation; Gender, female vs. male; Model I, direct effects of parental education on educational persistence; Model II, direct effects of self-regulation on educational persistence; Model III, direct effects of parental education on sustained school engagement; Model IV, full mediation model; Model V, multigroup moderation by parental education; N, sample size per model; ethnic majority, white; PARED, defined as higher parental education for Edu 3 = 1 and lower parental education for Edu 3 = 0; RMSEA, root mean square error of approximation; SRMR, standardised root mean residual.

<sup>a</sup>Probit regression coefficient.

<sup>b</sup>Chi-square difference (DIFFTEST) testing with the WLSMV estimator is not available with multiple imputation. Thus, the moderated mediation model was tested on a reduced sample size without multiple imputation.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



to higher school engagement through self-regulatory skills. The model explained 19% of the variance in persistence in education ( $R^2=0.19$ ,  $p<0.001$ ) and 19% of the variance in sustained school engagement ( $R^2=0.19$ ,  $p<0.001$ ). The indirect effects based on Model IV are presented in Table 3.

TABLE 3 Standardised specific indirect effects based on Model IV.

Indirect effect	B estimate (SE)	Two-tailed p-value
BSR → SCHENG → STILLED	0.04 (0.016)	0.013
ESR → SCHENG → STILLED	0.10 (0.027)	0.000
Edu 1 → SCHENG → STILLED	0.01 (0.014)	0.434
Edu 1 → BSR → SCHENG → STILLED	0.00 (0.001)	0.066
Edu 1 → ESR → SCHENG → STILLED	0.02 (0.006)	0.000
Edu 2 → SCHENG → STILLED	0.02 (0.013)	0.216
Edu 2 → BSR → SCHENG → STILLED	0.00 (0.001)	0.077
Edu 2 → ESR → SCHENG → STILLED	0.02 (0.006)	0.000
Edu 3 → SCHENG → STILLED	0.00 (0.015)	0.976
Edu 3 → BSR → SCHENG → STILLED	0.01 (0.003)	0.021
Edu 3 → ESR → SCHENG → STILLED	0.04 (0.011)	0.000
Edu 4 → SCHENG → STILLED	0.01 (0.008)	0.455
Edu 4 → BSR → SCHENG → STILLED	0.00 (0.001)	0.477
Edu 4 → ESR → SCHENG → STILLED	0.00 (0.002)	0.058
ETHNIC → SCHENG → STILLED	-0.06 (0.016)	0.000
GENDER → SCHENG → STILLED	0.05 (0.014)	0.000
ETHNIC → BSR → SCHENG → STILLED	0.00 (0.002)	0.037
GENDER → BSR → SCHENG → STILLED	0.01 (0.003)	0.018
ETHNIC → ESR → SCHENG → STILLED	0.005 (0.002)	0.022
GENDER → ESR → SCHENG → STILLED	0.01 (0.003)	0.001
ETHNIC → BSR → SCHENG	0.01 (0.003)	0.013
GENDER → BSR → SCHENG	0.02 (0.007)	0.005
ETHNIC → ESR → SCHENG	0.01 (0.005)	0.010
GENDER → ESR → SCHENG	0.03 (0.007)	0.000
Edu 1 → BSR → SCHENG	0.01 (0.004)	0.046
Edu 2 → BSR → SCHENG	0.01 (0.004)	0.050
Edu 3 → BSR → SCHENG	0.02 (0.007)	0.008
Edu 4 → BSR → SCHENG	0.00 (0.002)	0.469
Edu 1 → ESR → SCHENG	0.06 (0.012)	0.000
Edu 2 → ESR → SCHENG	0.06 (0.012)	0.000
Edu 3 → ESR → SCHENG	0.12 (0.019)	0.000
Edu 4 → ESR → SCHENG	0.01 (0.007)	0.000

Note: Indirect effects calculated with the MODEL INDIRECT command in *Mplus*.

Abbreviations: BSR, behavioural self-regulation; Edu 1, secondary education; Edu 2, A levels; Edu 3, higher education certificate/diploma/foundation degree; Edu 4, overseas qualification; ESR, emotional self-regulation; ETHNIC, ethnic majority (white) vs. ethnic minority; GENDER, female vs. male; SCHENG, sustained/trait school engagement; STILLED, persistence in education.

## Self-regulation, school engagement and educational persistence: Parental education 'differential hypothesis'

According to the above findings, the instilment hypothesis may have merit. Nevertheless, there could be an alternative explanation for the impact of parental education on the developmental pathway between self-regulation, sustained school engagement and educational persistence. That is, parental education may moderate the mediational relationships established above. To this end, we estimated two models. The first model was a fully constrained longitudinal model, whereby the first-order autoregressive effects (occasion-specific components) and the longitudinal regression coefficients were equal across higher and lower parental education background. The second model was a fully unconstrained model with freely estimated first-order autoregressive and regression coefficients. The DIFFTEST procedure indicated no significant degradation in model fit between the fully constrained and the unconstrained models,  $\Delta\chi^2(16)=18.654$ ,  $p>0.05$ . Hence, the differential hypothesis does not seem to hold much explanatory promise compared with the instilment hypothesis. The standardised parameter values of the constrained Model V are presented in [Table 2](#).

## DISCUSSION

Making the decision to persist in post-compulsory education is an important decision for all adolescents, and perhaps especially for young people from disadvantaged socio-economic backgrounds (Díaz-Vicario et al., 2019). A sizable group of adolescents do not continue with education after they are given the choice to stop attending school (Otero, 2007), and explanations of why adolescents decide to persist with their education remain under-researched. Given the long-term benefits of early school engagement and self-regulation for social and economic outcomes in young adulthood and middle adulthood (Abbott-Chapman et al., 2014; Diamond & Lee, 2011; Symonds et al., 2022), the present study specified and tested two explanatory mechanisms of adolescents' choice to persist in post-compulsory education. The focus of the study was on psychological mechanisms representing agency (Schoon & Heckhausen, 2019), namely self-regulation and school engagement, that could potentially buffer the socio-economic gradients in adolescents' educational persistence. Two hypotheses were tested regarding the potential impact of socio-economic gradients in the choice to persist in post-compulsory education, namely the 'instilment' and the 'differential' hypotheses. In the sections below, we unpack our findings and discuss the implications in detail.

In seeking to address our research objectives, special emphasis was placed on school engagement, which was operationalised as both emotional investment and behavioural involvement in schooling (Fredricks et al., 2019). However, our methodological innovation, in line with state–trait theory (Steyer et al., 2015), was that we assumed that students had a developmental history of engaging and disengaging with school, which indicates that student engagement may be characterised by both continuity and discontinuity and maybe, thus, saturated by both a stable trait-like and occasion-specific situational variance. This is something that has not yet been explored by longitudinal studies of students' school engagement (Abbott-Chapman et al., 2014; Ladd & Dinella, 2009; Symonds et al., 2022; Wang & Fredricks, 2014). Therefore, we computed a trait–state–occasion model for school engagement to examine the extent to which students' school engagement was stable or transient across early childhood and mid-adolescence. The results of the state–trait occasion model revealed, in line with person–environment perspectives (Eccles & Roeser, 2009), that students' school engagement was more transient and influenced by situational developmental characteristics on each occasion. However, there was an average of about 20% of the school engagement variance that was stable from age 7 to age 14. This stable school

engagement captured students' *sustained* engagement with school from middle childhood to mid-adolescence.

Despite the above, it was unreasonable to assume that sustained school engagement alone would be sufficient for explaining late adolescent educational persistence. Therefore, we introduced early self-regulation, which is a more trait-like variable (Bridgett et al., 2015), as a predictor of later sustained school engagement and educational persistence.

The results of the longitudinal modelling indicated that early childhood self-regulation at age 5 was a considerable predictor of sustained school engagement from late childhood into early adolescence (7–14). This finding complies with preceding evidence suggesting that successful acquisition of early self-regulatory skills is a pre-requisite for attaining a good level of engagement with school-related activities (Blair & Raver, 2015; Eisenberg et al., 2010; Jahromi et al., 2013). Hence, we could be confident that to build a good capacity for engaging with school, students need to acquire sufficient self-regulation in pre-school and in families. It ought to be noted, though, that this study is among the first to explore the link between early self-regulation and *sustained trait-like* school engagement. Yet it remains to be seen whether these links between self-regulation and sustained school engagement were influenced by socio-economic gradients and what was the potential influence of these two important variables on persistence in post-compulsory education.

As a second step in our model-building procedure, we utilised sustained school engagement as a mediator between early emotional and behavioural self-regulation at age 5 and persistence in post-compulsory education in late adolescence at age 17. The results of our longitudinal model illustrated that having stable school engagement was a good predictor of late adolescents' educational persistence. Sustained school engagement was also found to fully mediate the association between early self-regulation and persistence in post-compulsory education.

Studies have shown that having higher early school engagement is connected to better health and well-being, academic attainment and job prospects (Abbott-Chapman et al., 2014; Kautz et al., 2014; Symonds, Schoon, et al., 2016; Symonds et al., 2022). These studies signal that greater school engagement is beneficial for attaining greater educational levels in later life, yet it is uncertain from this prior research whether school engagement can predict late adolescent students' choice to continue their educational pathways in post-compulsory education. Our findings seem to comply with the above evidence to the extent that students, who managed to sustain their engagement with school, had greater likelihood of making the decision to persist in post-compulsory education.

Another strand of research has also emphasised the importance of early self-regulation for later academic success in school (Lenes et al., 2020) and later-life educational attainment in adulthood (Andersson & Bergman, 2011; McClelland et al., 2013). However, in the current study, we observed that sustained school engagement completely mediated the influence of early self-regulation on persistence in post-compulsory education. This finding suggests that early childhood self-regulation capacity is crucial for sustained school engagement, negating, thus, the independent influence of self-regulation at age 5 on late adolescent persistence in post-compulsory education. This is an important and noteworthy observation as secondary education is routinely identified as a challenging period for adolescents, with increased risk of problematic externalising behaviours (bullying, substance abuse etc.) and disengagement from school (Skinner & Pitzer, 2012). However, addressing such behaviours with interventions once they have manifested in adolescence is extremely difficult. As such, in light of the persisting influence that early childhood self-regulation has on later school engagement, future interventions seeking to address adolescent school disengagement should target attention to early periods of child development.

We accounted for the effects of parental education, as a longitudinally valid and reliable indicator of socio-economic status (Crosnoe, 2012; Haveman et al., 2004), on educational

persistence, self-regulation and school engagement. In greater detail, the structural analyses revealed that there exist socio-economic influences on children's and adolescents' self-regulatory skills, sustained school engagement and educational persistence. The impact of socio-economic influences persevered even in the full mediation model (Model IV). The only exception was that the pathways from parental education to sustained school engagement did not reach statistical significance when self-regulation was introduced into the model. This suggests a form of agency, whereby students' sustained school engagement from age 7 to age 14 was not affected by socio-economic gradients. However, attaining early self-regulatory capacity seems to be subject to strong socio-economic influences.

Although past studies have produced inconclusive evidence in favour of a predictive relationship between parental education, self-regulation (Duncan et al., 2017; Gestsdottir et al., 2014; Lenes et al., 2020; Sektnan et al., 2010) and school engagement (Abbott-Chapman et al., 2014; Cadima et al., 2015; Symonds et al., 2022), we found significant pervasive evidence that differences in the households in which children are brought up have a significant influence upon the self-regulation of children and the subsequent development of sustained school engagement in adolescence.

Most importantly, the association between socio-economic gradients and late adolescent students' choice to persist in post-compulsory education was partially mediated by both early self-regulation and sustained school engagement. This offered empirical support for an instilment hypothesis in a large representative sample, whereby students coming from higher socioeconomic status households had better socio-emotional skills in terms of self-regulation and school engagement. However, we did not find any evidence in favour of a differential hypothesis (Model V), whereby the system of mediating relationships was tilted in favour of the higher socioeconomic status students. Once again, this suggests that early experiences within the household have enduring influences on the development of child traits of self-regulation, and that such household influences potentially buffer against the development of problematic adolescent behaviours, specifically school disengagement. As such, the development of parental and early childhood interventions should be considered by future researchers to mitigate against these socially determined effects.

## Strengths and limitations

The present study utilised a large nationally representative sample coupled with longitudinal data to answer the main research objectives. The psychometric properties of the measures were also very good and measurement error was accounted for by using a latent variable approach. Despite the robust statistical and sampling procedures that the present study relied upon, it should be noted that the current study also suffered from a few limitations. Specifically, we used a brief measure of school engagement owing to data availability, even though the measure captured core aspects of engagement as outlined by engagement researchers (Fredricks et al., 2004). Additionally, we recommend a replication of the findings with an independent sample and the inclusion of further covariates, such as cognitive ability and social class. In the current study we focused our covariates on the important role of parental education while controlling for ethnicity and gender as potential confounders.

## CONCLUSION

In this study, we explored how the psychological agency mechanism of school engagement and self-regulation could potentially reduce the socio-economic gradients in late adolescents' choice to persist in post-compulsory education. The findings provided evidence in

favour of a partial mediation, whereby early self-regulation and sustained school engagement buffered in part the influence of socio-economic status. However, we also found that the parental education had an early influence on childhood self-regulation capacities, which had lagged effects on adolescent school engagement. We suggest that these early influences may protect or guard against some of the later problematic and challenging risks of adolescent disengagement in school. As such, we tentatively recommend placing emphasis on early childhood self-regulatory skills when considering the development of interventions for the purpose of increasing both sustained school engagement and persistence throughout secondary school.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

### DATA AVAILABILITY STATEMENT

Data are available through the UK Data Archive (<http://doi.org/10.5255/UKDA-Serie-s-2000031>).

### ETHICS STATEMENT

The study was conducted in accordance with the ethical guidelines of BERA (2018). Each wave of the MCS has received full ethical approval from London Multi-Centre Research Ethics Committee (MREC/03/2/022; 05/MRE02/46; 07/MRE03/32; 11/YH/0203; 13/LO/1786 17/NE/0341). Informed consent was obtained and the children consented to participate.

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