

Social inequalities in early childhood competences, and the relative role of social and emotional versus cognitive skills in predicting adult outcomes

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This study draws on the nationally representative British Birth Cohort Study (BCS70) to examine (1) the association between social background and early socio-emotional and cognitive competences at age 5 and (2) the relative and independent contributions of early socio-emotional and cognitive competences to educational and socio-economic attainment in adulthood. A multi-dimensional (multiple exposure, multiple outcome) approach is adopted in conceptualising social background, childhood competences and adult outcomes by age 42. Indicators of social background include parental education, social class, employment status, family income, as well as home ownership, enabling us to test which aspects of socio-economic risk uniquely influence the development of early competences. Indicators of childhood competences include directly assessed cognitive competences (i.e. verbal and visual motor skills), while measures of socio-emotional competences include hyperactivity, good conduct, emotional health and social skills, reported by the child's mother at age 5. Adult outcomes include highest qualifications, social class and household income by age 42. The findings suggest that multiple indicators of social background are associated with both socio-emotional and cognitive competences, although the associations with socio-emotional competences are less strong than those with cognitive competences. We find significant long-term predictive effects of early cognitive skills on adult outcomes, but also independent effects of socio-emotional competences, in particular self-regulation, over and above the role of family background. The study supports calls for early interventions aiming to reduce family socio-economic risk exposure and supporting the development of cognitive skills and self-regulation (i.e. reducing hyperactivity and conduct problems).

Keywords: adult socio-economic attainment; cognitive ability; multiple exposure multiple outcome (MEMO) approach; social inequality; socio-emotional competences

Introduction

Social and emotional competences are increasingly recognised as vital for children's adaptive development in school, as well as in other settings and later life (Heckman & Kautz, 2012). While socio-economic status (SES) inequalities in cognitive competences and subsequent educational attainment are well documented (Crawford *et al.*,

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2017; Pensiero & Schoon, 2019), there is less understanding of SES inequalities in the formation of socio-emotional competences, especially during the early years (i.e. at entry to primary school). Nor is there enough evidence regarding the relative importance of early social, emotional and cognitive competences as predictors of later outcomes, in addition to and above the impact of family SES, in particular when a range of interlinked outcomes are considered.

The aim of this article is to unpack the associations between family SES background, early cognitive, social and emotional competences and later outcomes, and to shine a light on the multiple dimensions and relationships involved in the intergenerational transmission of SES disadvantage. In particular, we aim to gain a more comprehensive understanding of (1) the multiple SES dimensions shaping the development of early childhood competences, with a focus on socio-emotional competences expressed at age 5, the start of primary school in the UK and (2) the role of multiple early childhood competences in predicting later SES attainment by age 42, over and above the influence of parental SES. We adopt a multiple exposure, multiple outcome (MEMO) approach to obtain a better handle on the multiple dimensions of SES inequality, their simultaneous impact on multiple competences in early childhood and the joint influences of these competences on later outcomes. Such a multi-dimensional approach to the study of risk exposure and associated multiple outcomes is promoted in resilience research (Schoon, 2006, 2021a), informed by discussions regarding the multi-dimensional treatment of social origins in the sociology of education (Bukodi & Goldthorpe, 2013) and theories of resource substitution and amplification (Ross & Mirowsky, 2006).

Early childhood competences

Children's cognitive as well as social and emotional competences are considered drivers of academic and life success (Heckman & Kautz, 2012). Cognitive competences generally refer to a set of skills which enable the use of language, numbers and reasoning, and which can be assessed with standardised tests. The notion of social and emotional competences (sometimes also referred to as 'non-cognitive', 'soft', 'personality' or 'character' skills) refers to a broad range of capabilities that enable individuals to regulate their thoughts, emotions, behaviour and interactions with others (Gutman & Schoon, 2013; Schoon, 2021b). Research into individual differences in so-called non-cognitive skills has been hampered by the differences in terminology, level of analysis and approaches to measurement used across fields. There is, however, a consensus that multiple competences matter. Self-control of behaviour, emotion regulation and interpersonal skills have been repeatedly found to predict educational and career success (Gutman & Schoon, 2013; Domitrovich *et al.*, 2017; Liu, 2019), and will be the focus of this study.

The early years are considered vital in the development of cognitive, social and emotional competences, and thus for individuals' wellbeing across the life course. Governments around the world are increasingly intervening to promote the early development of competences by providing early childhood education and care (ECEC) (Melhuish, 2016), boosted by evidence that high-quality ECEC improves productivity and equity in the economy and society at large (Farkas, 2003; Heckman

et al., 2006; Lleras, 2008). The belief that early years services are part of the government's role has come to be accepted across the political spectrum in the UK (Melhuish, 2016: 16). This started with the New Labour government (1997–2010), which attempted to expand, simplify and co-ordinate early years provision, prompting an increased focus on early years ever since, with, for example, the Early Years Foundation Stage becoming a formal curriculum and assessment stage in 2008 and subsequent Conservative governments expanding access to free ECEC places (Melhuish, 2016).

While ECEC has expanded, the quality of delivery remains a concern, as does its accessibility and the benefits for children from different socio-economic backgrounds (Petitclerc *et al.*, 2017). For the design of effective and equitable ECEC, a better understanding of social inequalities in the development of early childhood competences is needed, in particular regarding the multiple factors that influence their emergence and expression. Moreover, a better understanding of the cognitive, social and emotional skills which are most predictive of successful adult outcomes is highly desirable so that early learning efforts can be focused most efficiently (Kuncel *et al.*, 2010).

Previous research on the role of childhood competences as predictors of later outcomes has mostly focused on specific indicators, such as general IQ (Schoon, 2010; Cucik *et al.*, 2017) or self-control (Moffitt *et al.*, 2011; Duckworth *et al.*, 2019). Alternatively, broader concepts such as non-cognitive or soft skills, indicated by composite measures, have been used (Heckman *et al.*, 2006; Heckman & Kautz, 2012; Liu, 2019). There is, however, less evidence on the relative and independent role of different cognitive, social and emotional competences manifest at school entry on later outcomes after controlling for the impact of parental SES. In this study we thus assess which relationships are most substantial, and for which competences there is the strongest statistical evidence of an association with later outcomes.

Structural influences on childhood competences—a multi-dimensional conceptualisation of SES

There is persistent evidence that a lack of family socio-economic resources (i.e. poverty, loss of employment, or low levels of parental education) is associated with adjustment problems in offspring (Yoshikawa *et al.*, 2012; Schoon, 2020). Children born into less privileged families show, in general, lower levels of educational attainment (Engle & Black, 2008; Pensiero & Schoon, 2019) and self-control (Evans & Rosenbaum, 2008; Flouri *et al.*, 2014; Ng-Knight & Schoon, 2016), and more emotional problems (Patalay & Fitzsimons, 2016). Although the role of SES in shaping individual competences has been studied extensively, SES has been operationalised in a variety of ways. Depending on discipline, the focus has been on parental education, income or social class. Moving beyond uni-dimensional conceptualisations of SES, such as a sole focus on parental education or income, we adopt a multi-dimensional approach in defining SES, 'decomposing' the influence of socio-economic risk (Duckworth & Schoon, 2012; Bukodi & Goldthorpe, 2013). We include indicators of parental education, social class, employment status and income, as well as financial advantage via assets such as home ownership, to provide broad coverage of parental

SES. It is argued that assessing the associations of multiple SES exposures with multiple outcomes simultaneously provides a better understanding of the relative and independent contribution of different exposures to different outcomes.

Past research has shown that parental class, income, assets and education—relating to different forms of parental resources, such as economic, socio-cultural and informational—have independent and distinct effects on individual lives (Bukodi & Goldthorpe, 2013; Schoon, 2020). For example, youth living in families who own their own home might develop higher levels of self-control because their lives are more predictable and stable (Saunders, 1990). Better educated parents might help their children to develop skills and strategies to deal with problems effectively and thus raise their perceptions of control, emotional stability and sense of responsibility (Ross & Mirowsky, 2013), whereas working class parents with little control over their jobs might emphasise obedience and conformity (Bornstein & Bradley, 2003; Lareau, 2003). Furthermore, unless multiple indicators of SES are considered, there is potential bias in overestimating the effect of a single indicator and underestimating the total effect of family SES (Bukodi & Goldthorpe, 2013; Pensiero & Schoon, 2019; Schoon, 2020).

Childhood competences as predictors of later outcomes

Previous research has established associations between early childhood competences (measured before or at entry to primary school) and adult socio-economic attainment. In particular, there is strong evidence linking early cognitive ability to later academic achievement (e.g. Claessens *et al.*, 2009), adulthood income, employment and SES (Schoon, 2010; Ritchie & Bates, 2013). This includes general cognitive ability as well as verbal competences (Schoon *et al.*, 2010; Parsons *et al.*, 2011) and non-verbal skills (Fitzpatrick *et al.*, 2015).

Do children's social and emotional competences also have an independent effect once the influence of cognitive ability is controlled for? Here, the evidence is less conclusive. There is some evidence to suggest that it does, although the focus has been on distinct competences. Moreover, the evidence refers to competences assessed at different ages during early and mid-childhood. For example, early self-control or self-regulation (measured during pre-school) is related to academic outcomes through childhood and adolescence (Washbrook *et al.*, 2013; Hammer *et al.*, 2018; Duckworth *et al.*, 2019). Self-control refers to the capacity to regulate one's thoughts, emotions and behaviour; it is positively associated with the development of executive function and negatively with externalising behaviour (Eisenberg *et al.*, 2010). There is consistent evidence linking the ability to regulate and sustain attention to educational achievement (Howse *et al.*, 2003; Turney & McLanahan, 2015).

Aspects of self-control during childhood are also important for later labour market outcomes. For instance, evidence from New Zealand's longitudinal cohort studies shows that lack of self-control measured at age 3 or 6 is associated with lower income, low SES and welfare dependence in adulthood (Moffitt *et al.*, 2011). In the UK, evidence from the 1970 British Cohort Study (BCS70) shows that higher scores on a teacher-reported measure akin to behaviour regulation, including assessment of concentration and perseverance measured at age 10, were associated with higher incomes

at age 30, over and above factors such as education and employment, while parent-reported indicators of anti-social conduct measured at age 5 did not matter in the multivariate model (Blanden *et al.*, 2007). Evidence from BCS70 as well as the National Child Development Study (NCDS) also suggests that lack of childhood self-control is associated with unemployment throughout the adult years (Daly *et al.*, 2015; Goodman *et al.*, 2015).

Regarding early emotional stability, evidence of beneficial effects on later outcomes is inconclusive (Masten *et al.*, 2005). While there is some support for the hypothesis that mental health difficulties can have spill-over effects on other domains of functioning (Pianta & Stuhlman, 2004), as for example shown in UK research linking emotional problems measured at age 11–14 and later academic performance (Patalay *et al.*, 2015). A meta-analysis of six large longitudinal studies by Duncan *et al.*, (2007) found that internalising behaviours (measured before age 5) were not significant predictors of later academic attainment. In a study by Layard *et al.*, (2014), childhood emotional wellbeing measured between age 5 and 16 was not as strongly related to a range of socio-economic outcomes such as adult educational attainment or income by age 34 as cognitive ability, but mattered more as a predictor of adult mental health and wellbeing.

There is also evidence to suggest long-term beneficial effects of early interpersonal or social skills. For example, in a US study, childhood social competence in interacting with peers measured at age 8 was associated with better work competence (i.e. a record of holding down a job successfully and carrying out responsibilities well) at age 20 (Masten *et al.*, 2010). Evidence from BCS70 suggests that social competence in childhood (interaction with peers measured at age 10) predicts hourly pay by age 42 (Goodman *et al.*, 2015), as well as entrepreneurial status and earnings among the self-employed at age 34 (Obschonka *et al.*, 2012).

The present study

The aims of this study are to expand the current evidence base, and (1) assess the association between multiple dimensions of family social background and the manifestation of early socio-emotional and cognitive competences before school entry and (2) assess the relative and independent contributions of early social, emotional and cognitive competences measured before or at entry to primary school (i.e. at age 5) and family background on later educational and socio-economic attainment. We adopt a MEMO approach in conceptualising both SES and childhood competences, and examine the impact of multiple exposures to SES disadvantage on multiple outcomes (i.e. different indicators of childhood competences); in addition, we examine the combined effect of parental SES and own childhood competences in shaping different adult outcomes.

The study adds to the literature in many ways. First, most previous studies focused on single indicators of social origin, while we take into account the role of multiple SES indicators in shaping early competences. Second, although many of the social, emotional and cognitive competences are interlinked, most studies examine specific skill sets in isolation and few studies simultaneously assess multiple distinct competence sets as predictors of adult outcomes. Third, most studies explore the effect of

distinct competences on a single outcome. There is thus no conclusive evidence which of the diverse characteristics are crucial to improve or facilitate attainment across domains. While evidence on the predictive power and beneficial effects of early cognitive skills for later socio-economic outcomes is extensive, evidence on the relative importance of early social and emotional competences as predictors of adult outcomes over and above cognitive competences and parental SES is still scarce. Fourth, previous research on socio-emotional competences focused mostly on competences assessed during the school years, with less evidence regarding early competences already manifest during the pre-school years.

We also assess *how* these associations might operate: Do early childhood competences predict later SES attainment independently of parental SES? Or are early childhood socio-emotional competences more beneficial for young people from less privileged backgrounds, allowing them to succeed against the odds? In particular, we test three different assumptions regarding the relationships between parental SES, individual competences and adult socio-economic attainment:

- a *Independent effect hypothesis* assuming that childhood competences predict later socio-economic attainment independent of parental SES.
- b *Compensatory effect or resource substitution hypothesis* (Ross & Mirowsky, 2006) assuming that childhood competences are particularly beneficial for young people from less privileged backgrounds, enabling them to succeed against the odds. In other words, individual competences are assumed to compensate for the lack of socio-economic family resources and enable young people to attain high levels of education, social position and income despite a disadvantaged family background. Potential compensatory effects, also described by the term ‘resource substitution’ (Ross & Mirowsky, 2006), refer to processes where one resource (e.g. individual competences) can substitute for another (lack of socio-economic resources). The ‘resource substitution’ hypothesis predicts the worst outcomes for those with neither resource.
- c *Cumulative effect (or resource multiplication/amplification) hypothesis* assuming that children from relatively privileged backgrounds benefit more from higher levels of competences than their less privileged peers. Resource amplification is a special case of resource substitution, occurring when adverse social conditions decrease the likelihood of attaining personal resources that otherwise would moderate the condition’s undesirable consequences (Ross & Mirowsky, 2006). In this case, the level of early competences is a consequence of parental SES status and also a mediator of parental SES on later attainment. In theory, this leads to a situation in which disadvantaged social origins decrease the likelihood of attaining high levels of competences, the very resource needed to enable children from disadvantaged family backgrounds to attain social mobility and get a good education, job, etc. In contrast, relative advantaged children are more likely to acquire relevant competences than their more disadvantaged peers and are more likely to achieve a high socio-economic status.

Method

Data

We use data from BCS70, a nationally representative study, following the lives of 17,196 babies born in England, Scotland and Wales in one particular week in 1970 (Elliott & Shepherd, 2006; <https://cls.ucl.ac.uk/cls-studies/1970-british-cohort-study/bcs70-age-42-sweep/>). Following a first assessment at birth, subsequent surveys took place when cohort members were aged 5, 10, 16, 26, 30, 34, 38 and 42 years. Like all longitudinal studies, BCS70 suffers from sample loss and attrition over time. The analytic sample comprises 12,666 study members with information on the different indicators of family SES, childhood competences and adult outcomes by age 42. The degree of missingness is highest for own family income at age 42 (41%). For the other variables it varies between 0 and 20%. To account for missingness in the data, we used multiple imputation by chained equations (MICE) as implemented in STATA (Royston & White, 2011).

Measurement of key variables

Parental SES. Indicators of parental socio-economic position were assessed at birth and age 5, including measures of parental education, parental social class, employment status, income and home ownership. *Parental education* is defined by the highest academic qualification achieved by either parent (dominance approach). We used an academic definition of qualifications: low-level education (less than or equal to the General Certificate of Education [GCE, level 1]); GCE Ordinary (O)-levels (level 2) (indicating completion of secondary school); post-compulsory A-level (level 3) qualifications (enabling access to university); and degree-level qualification (level 4 and higher). *Parental social class* was indicated by the Registrar General's measure of social class (RGSC). RGSC is defined according to occupational status and associated education, prestige or lifestyle (Marsh, 1986) and is assessed by the current or last held job of either parent (dominance approach). RGSC was coded on a four-point scale: I/II professional and managerial class; III skilled non-manual; IIIM skilled manual; IV/V semi- and unskilled occupations (Leete & Fox, 1977). Class I/II is associated with the highest level of prestige or skill, and class IV/V the lowest. *Parental worklessness* was assessed at the household level (not the individual level). A workless family was defined as a family where no parent living in the household was in work at the time the family was interviewed. *Parental income* is measured as gross weekly family income, and *home ownership* differentiates between families who own their own home and families living in council or other forms of social or rented housing.

We further constructed a single *SES index* based on a latent variable created from a generalised structural equation model using binary SES risk indicators comprising low parental education (less than GCE), low social class (semi/unskilled occupations), parental worklessness (neither parent in employment), low family income (bottom 30%) and no home ownership. We used the single SES index in the mediation analysis to consider the indirect effects of SES via each of the childhood competences.

Social and emotional competences measured at age 5. Our indicators of social and emotional competences were assessed with four subscales of the mother-reported Rutter Behaviour Questionnaire (1970). These included measures of behaviour regulation, emotional stability and social skills. *Behaviour regulation* was assessed with two subscales: *Hyperactivity*—including questions relating to restlessness, fidgeting, being irritable and unsettled; and *Conduct*—with questions relating to destroying things, fighting, stealing, lying and being disobedient. Each of these scales has good internal consistency (Cronbach alpha for conduct = 0.68 and for hyperactivity = 0.62). *Emotional stability* was assessed with the emotional subscale, including questions relating to being worried, miserable, fearful and fussy ($\alpha = 0.62$). *Social skills* were assessed with a subscale tapping into the quality of peer relations, with questions relating to not being liked, being solitary and bullying others ($\alpha = 0.26$). All scales were recoded so that a high score indicates low levels of hyperactivity, good conduct, emotional stability and good social skills, and all competence scales were standardised to a mean of 0 and standard deviation of 1.

Cognitive skills measured at age 5. We utilise two measures of directly assessed cognitive ability, based on assessments carried out at age 5. *Verbal skills* were assessed with the English Picture Vocabulary Test (EPVT), an adaptation of the American Peabody Picture Vocabulary Test (Brimer & Dunn, 1962). The test consists of 56 sets of four different pictures, with a particular word associated with each set of four pictures. The child is asked to indicate the one picture that corresponds to the given word, and the test proceeds with words of increasing difficulty, until the child makes five mistakes in a run of eight consecutive items. The test has good internal consistency ($\alpha = 0.96$). *Non-verbal skills* were assessed with the copy-a-design test to assess visual motor ability (Osborn *et al.*, 1984), assuming that children must have reached a certain level of conceptual development in order to be able to recognise the principles governing different geometric forms, and to reproduce them. The ability to copy designs or geometric shapes is included as one element in many standard intelligence tests. The test has a satisfactory reliability of 0.70. All cognitive assessments were standardised to a mean of 0 and standard deviation of 1.

Outcomes at age 42. Indicators of the child's socio-economic attainment at age 42 include measures of educational and occupational attainment, as well as income. *Educational attainment* is defined by the highest academic qualification achieved. We used an academic definition of qualifications: low-level education (less than or equal to the General Certificate of Secondary Education [GCSE, level 1]); GCSE Ordinary (O)-levels (level 2); post-compulsory A-level (level 3) qualifications (enabling access to university); and degree-level qualification (level 4 and higher). *Occupational attainment* was derived using the National Statistics Socio-Economic Classification (NS-SEC). Originally defined in Goodman *et al.*, (2015), we differentiate reaching a 'top job' (i.e. a professional or managerial occupation) vs. others. An individual is characterised as reaching a top job if they've attained the highest NS-SEC classification (higher managerial, administrative and professional) in any wave between cohort member age 26 and 42. This comprises approximately 29% of our estimation sample. The assessment of *Family income* is based on the combined information regarding

earnings, other sources of income, benefits received and tax credits. We combined both the cohort member's net pay from their main job and their partner's, should they have one, as well as subsidiary net pay of the cohort member from other jobs. All components of the net family income measure are converted to weekly amounts, before being added together and then logged, meaning the final measure captures the log of weekly net family income.

Analytic approach. To examine the role of multiple SES indicators in shaping early competences, we first describe the associations between parental SES and child competences (Table 1) and run ordinary least squares (OLS) regressions (Table 2) of each of the competences on each of the individual risk factors.

Our primary analysis (Tables 3–5) then consists of two stages. The first stage is an OLS analysis examining the independent effect of childhood competences on adult outcomes. We first consider the association between each of the parental SES risk factors and each of the adult outcomes at age 42 (Model 1). We regress each outcome on the full set of individual risk factors, using ordered probit for the ordered outcome (*Education*), probit when the outcome is binary (*Top Job*) and OLS regression when the outcome is continuous (*Income*), reporting marginal effects for each. The second model (Model 2) includes the full set of cognitive and socio-emotional competences, exploring the effects of each of these competences independent of the parental SES factors.

The second stage is a mediation analysis (mediation model) using generalised structural equation modelling (gSEM), which explores the role of the competences in explaining the associations between parental SES and the three adult outcomes (i.e. the potential compensatory or cumulative effects of childhood competences). For this we utilise the SES risk index constructed using the five individual SES risk factors as a single measure for SES. The full mediation model contains the SES index, each of the individual childhood competences as mediators (six in total), each of the competences interacted with the SES index and the demographic controls. We first report the total effect of SES (i.e. its association with the outcome). This total effect is then decomposed into direct and indirect SES effects. The direct SES effect is that part of the total effect that is not mediated via the competences. The indirect effects represent the pathways from SES index to each of the competences combined with the pathway from that competence to the outcome, indicating the part of the total SES effect that is mediated by that competence. The competence*SES interactions allow us to examine whether there is any heterogeneity in the impact of parental SES by each of the child competences (i.e. if the childhood competences show a compensatory or cumulative effect). Lastly, we explore whether the estimated parameters pertaining to the pathways in the full mediation model vary by sex.

Demographic controls. In all models we condition on three binary demographic measures pertaining to the cohort member: their sex (0 = male; 1 = female), birth weight (below 2,500g = 1; other = 0) and ethnicity (White British = 0; other = 1).

Results

SES influences on childhood competences

Table 1 shows the bivariate correlations between the overall SES index, all parental SES indicators and the child's social, emotional and cognitive competences at age 5. The correlations between parental SES indicators range from 0.08 to 0.45, suggesting that multi-collinearity is not an issue. To confirm this, we find that none of the variance inflation factor values for any of the SES risk factors or childhood competences exceed 2. Compared to the indicators of social and emotional competences, the two indicators of cognitive skills are more strongly associated with the family SES characteristics. Associations between the childhood competences and single indicators of SES are not as strong as the associations with the SES summary index, suggesting that when we use only one indicator of SES we are underestimating the corrosive effect of SES on early child development. We also see moderate to strong associations between the different social and emotional child competences, suggesting that a child with high competences in one dimension is likely to have higher competences in other dimensions too. However, associations between cognitive and socio-emotional competences are less strong.

Table 2 shows the multiple OLS regression analysis of each of the childhood competences on the different indicators of parental socio-economic background. The different competences are predicted by multiple SES indicators, except for emotional adjustment which is only associated with maternal education and social housing. Otherwise, most of the SES indicators show independent effects in shaping early childhood competences. In particular, when mutually adjusted we find significant associations between maternal education as well as social housing with all of the childhood competences considered here. Cognitive abilities appear to be more strongly affected than socio-emotional competences.

Tables 3–5 show the stepwise associations between SES indicators, childhood competences and adult outcomes at age 42—all using the same modelling approach described above. Table 3 focuses on highest educational attainment. We find that each of the SES indicators, except for parental worklessness, shows significant associations with educational attainment (Model 1). Model 2 shows that the association between educational attainment by age 42, parental education and housing is reduced but remains significant after considering the different childhood competences, while the associations between adult educational attainment, parental social class and family income become non-significant. Of the childhood competences, we find a significant positive association between the cognitive competences (visual motor and verbal skills) and behaviour regulation (low hyperactivity and conduct problems) and educational attainment by age 42, while the association between emotional stability and educational attainment is negative when mutually adjusted. The findings suggest that the childhood competences show an independent effect on educational attainment by age 42, over and above the influence of family SES. In particular, cognitive competences and behaviour regulation play a beneficial role, facilitating educational attainment, while emotional stability shows a negative effect. Gender-specific analyses (see Tables S1 and S2 in the online Supplementary Material) show that low hyperactivity

Table 1. Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Low SES index score	1													
2 Low Education Mother	0.72***	1												
3 Low Education Father	0.75***	0.45***	1											
4 Workless HH	0.17***	0.05***	0.05***	1										
5 Low Social Class Mother	0.60***	0.34***	0.27***	0.04***	1									
6 Low Social Class Father	0.47***	0.18***	0.23***	0.12***	0.24***	1								
7 Low Family Income	0.56***	0.20***	0.23***	0.07***	0.19***	0.17***	1							
8 Social Housing	0.57***	0.27***	0.29***	0.09***	0.26***	0.22***	0.24***	1						
9 Low Hyperactivity	-0.15***	-0.10***	-0.11***	-0.02	-0.08***	-0.08***	-0.08***	-0.11***	1					
10 Low Conduct Problems	-0.18***	-0.12***	-0.11***	-0.05***	-0.13***	-0.10***	-0.07***	-0.16***	0.48***	1				
11 Low Emotional Problems	-0.04***	-0.04***	-0.02	-0.02	-0.02	-0.02	-0.01	-0.03***	0.26***	0.16***	1			
12 Low Peer Problems	-0.15***	-0.09***	-0.08***	-0.0 [#]	-0.13***	-0.08***	-0.08***	-0.11***	0.27***	0.34***	0.28***	1		
13 Visual Motor Skills	-0.27***	-0.18***	-0.20***	-0.02	-0.17***	-0.14***	-0.14***	-0.18***	0.15***	0.16***	0.02	0.08***	1	
14 Verbal Skills	-0.27***	-0.15***	-0.15***	-0.06***	-0.19***	-0.15***	-0.16***	-0.18***	0.11***	0.15***	0.05***	0.14***	0.30***	1

Note: N = 12,666.

[#] p < 0.01;

*** p < 0.001.

Table 2. Linear regression of child competences on SES risk factors

	Low hyperactivity probability	Low conduct probability	Low emotional probability	Low peer probability	Visual motor	Verbal
Low Education (Mother)	-0.085*** -0.024	-0.095*** -0.024	-0.078 [#] -0.024	-0.067 [#] -0.025	-0.136*** -0.023	-0.121*** -0.022
Low Education (Father)	-0.093*** -0.024	-0.068 -0.023	0.013 -0.026	-0.028 -0.025	-0.199*** -0.022	-0.102*** -0.026
Workless HH	-0.069 -0.057	-0.222 [#] -0.067	-0.078 -0.067	-0.126 -0.064	0.025 -0.068	-0.205 [#] -0.066
Low Social Class (Mother)	-0.076 -0.034	-0.114*** -0.03	-0.010 -0.032	-0.157*** -0.035	-0.145*** -0.032	-0.221*** -0.043
Low Social Class (Father)	-0.090*** -0.026	-0.113*** -0.029	-0.020 -0.029	-0.083 [#] -0.028	-0.164*** -0.028	-0.198*** -0.029
Low Family Income	-0.062 -0.027	-0.018 -0.024	0.015 -0.024	-0.067 [#] -0.023	-0.107*** -0.023	-0.169*** -0.029
Social Housing	-0.128*** -0.026	-0.198*** -0.028	-0.056 [#] -0.021	-0.120*** -0.026	-0.191*** -0.026	-0.163*** -0.028

Note: $N = 12,666$.

Each column displays parameter estimates and standard errors from an OLS regression of each childhood competence, respectively, on the SES risk factors.

All SES risk factors are binary, while all childhood competences are standardised.

[#] $p < 0.01$;

*** $p < 0.001$.

problems are associated with higher educational attainment for females but not for males. Also, once competences are controlled, low family income is no longer associated with educational attainment for females.

The mediation model uses the summative SES risk index, examining both the independent effect of each of the individual competences and the interactions between each competence and the SES index. The SES total effect (-0.877) reflects the association between the SES index and the outcome, taking into account the role of childhood competences and interactions as mediators. The negative coefficient suggests that the more risks experienced, the lower the achieved level of education by 42. Of the total SES risk effect, -0.674 , or 77%, is direct. The remaining 23% is indirect via the child competences, with visual motor, verbal competences, hyperactivity and conduct accounting for -0.102 (12%), -0.071 (8%), -0.012 (1%) and -0.031 (4%) of the total effect, respectively (shown in column 5). The indirect effects regarding emotional stability are positive, suggesting potential suppressor effects. There are no significant interactions between the SES index and the childhood competences (column 6). Gender-specific analysis shows largely similar processes for males and females, although there is a significant interaction between the SES index and visual motor competences for females (-0.099), suggesting a weak cumulative effect.

Table 4 shows the associations between family SES, childhood competences and top job status at age 42. We find that four out of six SES indicators are associated with occupational attainment, except for parental worklessness and maternal social class (Model 1). Considering the simultaneous influence of childhood competences

Table 3. Highest education level at age 42 by family SES and childhood competences

	Ordered probit		Mediation model			
	Model 1	Model 2	SES total	SES direct	SES Indirect	Interactions
<i>SES risk factors</i>						
Low Education (Mother)	-0.544***	-0.464***				
Low Education (Father)	-0.048	-0.046				
Workless HH	-0.558***	-0.451***				
	-0.045	-0.044				
	-0.226	-0.159				
	-0.109	-0.109				
Low Social Class (Mother)	-0.243***	-0.151				
	-0.057	-0.056				
Low Social Class (Father)	-0.218***	-0.132				
	-0.055	-0.053				
Low Family Income	-0.168***	-0.104				
	-0.041	-0.041				
Social Housing	-0.546***	-0.418***				
	-0.047	-0.046				
SES Index			-0.877***	-0.674***		
			-0.024	-0.028		
<i>Cognitive competences</i>						
Visual motor		0.301***			-0.102***	-0.063
		-0.021			-0.008	-0.028
Verbal		0.212***			-0.071***	-0.03
		-0.02			-0.008	-0.028
<i>Socio-emotional competences</i>						
Low Hyp Prob		0.061 [#]			-0.012 [#]	-0.017
		-0.023			-0.004	-0.031
Low Con Prob		0.137***			-0.031***	-0.019
		-0.027			-0.007	-0.028
Low Emo Prob		-0.093***			0.005 [#]	-0.011
		-0.022			-0.002	-0.025
Low Peer Prob		-0.015			0.004	0.004
		-0.023			-0.004	-0.027
<i>Demographics</i>						
Low Birth Weight	-0.182	-0.039	-0.181			
	-0.08	-0.078	-0.08			
Male	-0.274***	-0.237***	-0.277***			
	-0.034	-0.036	-0.034			
Non-White	0.282	0.615***	0.343 [#]			
	-0.126	-0.135	-0.118			
Fit Statistics: CD	0.14	0.19	0.26			

Note: N = 12,666.

Coefficient of determination (CD) can be interpreted as an R-squared for the whole model. Models 1 and 2 display parameter estimates and standard errors from an ordered probit regression, with and without socio-emotional competences, respectively. Columns 3 to 6 present parameters and standard errors from a single mediation model, using gSEM. All SES risk factors are binary, while all childhood competences are standardised. The SES total effect represents the association between the SES index and highest education level at age 42. The SES direct effect captures the amount of the total effect which is not mediated through childhood competences. The SES indirect effects capture the association between the SES index and highest education level at age 42, which is mediated through each of the childhood competences. The interactions present the parameters on the SES index*competences interactions, which assess whether there is any heterogeneity in the impact of parental SES by each of the child competences (i.e. if the childhood competences show a compensatory or cumulative effect).

[#] p < 0.01;

*** p < 0.001.

Table 4. Occupational status (top job) at age 42 by family SES and childhood competences

	Probit		Mediation model			
	Model 1	Model 2	SES total	SES direct	SES indirect	Interactions
<i>SES risk factors</i>						
Low Education (Mother)	-0.068***	-0.054***				
Low Education (Father)	-0.092***	-0.074***				
Workless HH	-0.013	0				
Low Social Class (Mother)	-0.037	-0.021				
Low Social Class (Father)	-0.046***	-0.031 [#]				
Low Family Income	-0.050***	-0.039***				
Social Housing	-0.009	-0.009				
	-0.079***	-0.057***				
	-0.01	-0.01				
SES Index			-0.139***	-0.104***		
			-0.005	-0.006		
<i>Cognitive competences</i>						
Visual motor		0.052***			-0.018***	-0.014
		-0.005			-0.002	-0.006
Verbal		0.040***			-0.014***	-0.016 [#]
		-0.006			-0.002	-0.006
<i>Socio-emotional competences</i>						
Low Hyp Prob		0.005			-0.001	-0.004
		-0.006			-0.001	-0.006
Low Con Prob		0.020***			-0.004***	-0.002
		-0.005			-0.001	-0.006
Low Emo Prob		0.002			0	-0.009
		-0.005			0	-0.006
Low Peer Prob		-0.004			0.001	0.002
		-0.005			-0.001	-0.006
<i>Demographics</i>						
Low Birth Weight	-0.022	0.005	-0.022			
	-0.017	-0.017	-0.017			
Male	0.078***	0.080***	0.078***			
	-0.008	-0.008	-0.008			
Non-White	0.001	0.061 [#]	0.004			
	-0.021	-0.023	-0.021			
Fit Statistics: CD	0.07	0.09	0.22			

Note: $N = 12,666$.

Coefficient of determination (CD) can be interpreted as an R-squared for the whole model. Models 1 and 2 display parameter estimates and standard errors from a probit regression, with and without socio-emotional competences, respectively. Columns 3 to 6 present parameters and standard errors from a single mediation model, using gSEM. The SES total effect represents the association between the SES index and achieving a top job. The SES direct effect captures the amount of the total effect which is not mediated through childhood competences. The SES indirect effects capture the association between the SES index and achieving a top job, which is mediated through each of the childhood competences. The interactions present the parameters on the SES index*competences interactions, which assess whether there is any heterogeneity in the impact of parental SES by each of the child competences (i.e. if the childhood competences show a compensatory or cumulative effect).

[#] $p < 0.01$;

*** $p < 0.001$.

Table 5. Log family income at age 42 by family SES and childhood competences

	OLS		Mediation model			
	Model 1	Model 2	SES total	SES direct	SES indirect	Interactions
<i>SES risk factors</i>						
Low Education (Mother)	-0.061	-0.039				
Low Education (Father)	-0.043	-0.043				
Workless HH	-0.143***	-0.117#				
Low Social Class (Mother)	-0.04	-0.04				
Low Social Class (Father)	-0.133	-0.111				
Low Family Income	-0.116	-0.117				
Social Housing	0.047	0.071				
SES Index	-0.038	-0.041				
	-0.032	-0.009				
	-0.054	-0.054				
	-0.092	-0.076				
	-0.047	-0.048				
	-0.027	0.007				
	-0.047	-0.047				
			-0.135***	-0.084***		
			-0.021	-0.023		
<i>Cognitive competences</i>						
Visual motor		0.071#			-0.023***	-0.021
Verbal		-0.02			-0.007	-0.023
		0.071			-0.023*	-0.017
		-0.026			-0.009	-0.025
<i>Socio-emotional competences</i>						
Low Hyp Prob		-0.002			0	-0.008
Low Con Prob		-0.019			-0.004	-0.025
Low Emo Prob		0.036			-0.007	0.021
Low Peer Prob		-0.021			-0.005	-0.023
		0.007			0	0.006
		-0.017			-0.001	-0.022
		-0.008			0.002	0.008
		-0.016			-0.003	-0.023
<i>Demographics</i>						
Low Birth Weight	-0.152	-0.112	-0.151			
Male	-0.07	-0.07	-0.07			
Non-White	-0.192***	-0.192***	-0.194***			
Fit Statistics: CD	-0.03	-0.03	-0.03			
	-0.089	0.008	-0.068			
	-0.102	-0.101	-0.099			
	0.01	0.02	0.19			

Note: $N = 12,666$.

Coefficient of determination (CD) can be interpreted as an R-squared for the whole model. Models 1 and 2 display parameter estimates and standard errors from an OLS regression, with and without socio-emotional competences, respectively. Columns 3 to 6 present parameters and standard errors from a single mediation model, using gSEM. The SES total effect represents the association between the SES index and adult family income. The SES direct effect captures the amount of the total effect which is not mediated through childhood competences. The SES indirect effects capture the association between the SES index and adult family income, which is mediated through each of the childhood competences. The interactions present the parameters on the SES index*competences interactions, which assess whether there is any heterogeneity in the impact of parental SES by each of the child competences (i.e. if the childhood competences show a compensatory or cumulative effect).

$p < 0.01$;

*** $p < 0.001$.

(Model 2) reduces the associations for family SES but does not remove it. Of the childhood competences, we find a significant independent effect for the indicators of cognitive competences (verbal and visual motor ability) and good conduct. Regarding the mediation model we find a total SES effect of -0.139 , of which -0.104 (75%) is direct. Significant indirect pathways are found for visual motor (-0.018 or 13%), verbal (-0.014 or 10%) and conduct (-0.004 or 3%). The interaction terms suggest weak cumulative effects for verbal cognitive competences (-0.016). Gender-specific analysis (see Tables S3 and S4 in the online Supplementary Material) suggests that this finding is only significant for males and that good conduct is also only significantly associated with top job status for males.

Table 5 shows the associations between family SES, childhood competences and own family income at age 42. We find that only father's level of education shows a significant association with own adult income (Model 1). Considering the simultaneous influence of childhood competences (Model 2), father's level of education remains as a significant predictor. Of the childhood competences, we only find a significant independent effect for the indicators of cognitive competences (visual motor ability), but not any of the socio-emotional skills. Regarding the mediation model, the total SES effect is -0.135 , of which -0.084 (62%) is direct. Significant indirect pathways are found for visual motor and verbal competences (both -0.023 or 17%), with no significant pathways via any of the socio-emotional competences. The interaction terms suggest no meaningful differences in the impact of the SES index across child competences. The gender-specific analysis (see Tables S5 and S6 in the online Supplementary Material) shows that the influence of father's education is only significant for males (once early competences are accounted for). Additionally, for males, visual motor skills are a stronger predictor of adult income compared to females.

Discussion

This study provides new and robust empirical evidence regarding social inequalities in the development of early child competences and the long reach of these competences for later outcomes. Regarding the role of family SES, the findings highlight the independent effects of multiple socio-economic indicators in shaping the manifestation of early competences, in particular cognitive skills, pointing to different mechanisms behind the development of social inequalities. The exception is childhood emotional adjustment, which appears to only be associated with maternal education and housing conditions. Adopting a MEMO approach for assessing processes of social mobility thus appears to be a promising avenue for future research. Each of the indicators of family SES shows a significant bivariate association with the childhood competences and should be considered as distinct aspects of social origin. Using only one indicator of SES bears the risk of underestimating the corrosive effect of SES on early child development, but also of overestimating the impact of a distinct SES risk factor, such as family income (Bukodi & Goldthorpe, 2013; Pensiero & Schoon, 2019). Likewise, focusing on only one outcome, such as cognitive competences, provides only a partial understanding of children's adjustment (Schoon, 2006). It is, for example, possible that children show good cognitive development but at the same time experience emotional problems, or vice versa. Examining SES influences on a

range of outcomes enables a broader view of children's development in the face of socio-economic adversity. Moreover, considering multiple influences simultaneously gives a better understanding regarding the design of effective interventions. For example, while family income is associated with cognitive development and peer problems, it is not sufficient to support emotional and behaviour regulation of children. Enabling maternal education and improving housing conditions seem to be key leverages for supporting the development of early social and emotional as well as cognitive competences. These resources probably reflect children's need for cognitive stimulation and security, in particular during the early years.

Regarding the predictive power of childhood competences measured at age 5 on adult outcomes at age 42, we were able to identify the independent effect of different socio-emotional and cognitive skills on later outcomes, over and above the influence of family SES. Going beyond previous studies that mostly focused on the long-term benefits of single skills or specific skill compounds, we were able to assess the relative contribution of different skill sets for a range of outcomes. The strongest evidence relates to the predictive power of early verbal and visual motor skills and early behaviour regulation, which are significant predictors of educational and occupational attainment at age 42, as well as income. The study confirms previous evidence regarding the role of early cognitive competences as predictors of adult outcomes (Claessens *et al.*, 2009; Ritchie & Bates, 2013; Fitzpatrick *et al.*, 2015; Schoon, 2010). In addition, it confirms the importance of behaviour-regulatory competences (Moffitt *et al.*, 2011; Washbrook *et al.*, 2013; Hammer *et al.*, 2018; Duckworth *et al.*, 2019) over and above cognitive competences and socio-economic risk exposure. Knowing which competences are relevant for a range of outcomes can help to inform the design of interventions aiming to improve general life chances and attainment by showing which skills are important to focus on. Considering the role of different childhood competences simultaneously generates better predictive power than by focusing on a single skill only. Moreover, taking into account the simultaneous influence of multiple competences as predictors of later outcomes provides a more comprehensive understanding of the underlying processes, which in turn can inform social policies aiming to promote the positive development and wellbeing of children and the design of interventions.

Regarding the processes linking family SES, childhood competences and adult outcomes, we find that both cognitive and behaviour-regulatory competences show independent effects regarding educational and occupational attainment, confirming assumptions of the independent effect hypothesis. In addition, there is a weak cumulative effect for verbal abilities regarding reaching a top job, suggesting that relatively privileged children benefit more from early manifestations of verbal competences, in particular males, who are more likely to achieve top jobs. Additionally, there is a weak cumulative effect for visual motor abilities for females, suggesting that relatively privileged girls can potentially benefit from early manifestations of these skills. We find no evidence for compensatory effects of early childhood competences. The findings thus suggest that support for development of early cognitive and behaviour-regulatory competences is generally beneficial for all. Moreover, our results do not suggest significant gender differences in these processes, with the exception that low conduct problems may play a greater mediating role in the relationship between SES and

occupational attainment for males, while low hyperactivity may play a greater mediating role in the relationship between SES and educational attainment for girls. These results suggest that there may be complex gender-differentiated patterns in the association of early behaviour with later outcomes across socio-economic groups, requiring further investigation in future research.

In our analysis we could not confirm the role of early emotional health or social skills as predictors of adult outcomes. This could be due to a number of reasons. First, it might be due to the quality of the assessment of these skills at age 5. In particular, the assessment of social skills showed a very low internal consistency. Another explanation is that we did not assess the sole effect of these skills on later outcomes (as in many previous studies), but controlled for the presence of other skill sets as well as a wide range of indicators of parental socio-economic background and child characteristics. Moreover, in the multiple variable models our indicator of emotional health showed unexpected relationships with some of the outcomes. For example, emotional stability at age 5 is associated with a lower level of educational attainment at age 42. Future research will have to delineate the combined effect of different social, emotional and cognitive skills in more detail, and also take into account possible combinations of skill sets, or skill profiles. Furthermore, the timing of the assessments matters. We did not control for social and emotional competences manifest later in life, focusing on the assessment of early competences measured at school entry. Studies controlling for later levels of adjustment find significant associations for competences manifest at age 10 but not earlier measures (Blanden *et al.*, 2007), suggesting that competences build on each other and that later levels of adjustment mediate competences manifest at earlier ages. Future studies should examine these evolving aspects of competence development in more detail.

In interpreting the findings, a number of limitations have to be considered. As with all longitudinal studies, we are constrained by having to make the best of the available data. The research is based on secondary analysis of existing data rather than randomised trials. This means that it is not possible to establish robust causal relationships. It is likely that other, unmeasured differences that have not been included in our models can play a role. Moreover, as in all longitudinal studies, missing data was encountered, both due to survey loss and incomplete responses. Response bias at the individual level would tend to underestimate the magnitude of effects of social disadvantage, as sample attrition is greatest among cohort members in more deprived circumstances (Elliott & Shepherd, 2006). To address missingness in the data, we used multiple imputation as implemented in STATA, yet the results might still provide a conservative estimate of social inequalities in the data. Furthermore, the study is limited by the quality of the collected data. This affected in particular the assessment of early social and emotional competences, which was restricted by the available measures and the low internal consistency of the social skills subscale. In addition, this study followed the development of children born in 1970 in the UK. Current cohorts of young people are facing quite different demands and new challenges, and further research is required to establish the generalisability of the findings for later-born cohorts, or for young people growing up in a different socio-cultural context. Evidence from the UK Millennium Cohort, however, suggests that the corrosive effect of family SES on early cognitive and socio-emotional development has, if anything,

increased rather than reduced in later-born cohorts, in particular regarding the role of family income and exposure to poverty (Schoon, 2020). In this study, the assessments of child competences were undertaken in early childhood, to tap into the role of competences manifest at school entry. While information on cognitive competences was assessed directly, we were restricted to parental reports for social and emotional competences. Extending the focus of the study to also include later assessments might have produced stronger associations, as social and emotional competences develop most rapidly at the entry to adolescence (Gutman & Schoon, 2013; Domitrovich *et al.*, 2017). In addition, we could have used multiple sources of reports, including teacher and own assessments of these competences. However, focusing on information on the predictive role of early competences, this study provides a comprehensive understanding of social inequalities in the formation of early competences, and the role of preschool competences as predictors of adult outcomes.

Conclusion

This study provided important insights into the multiple SES influences shaping early child development across domains, and the role of different early child competences as predictors of later outcomes. Generally, the findings support the call for improved access to early interventions among the less well off (Heckman, 2006; Melhuish, 2016). The multi-dimensional approach adopted in this study highlights that multiple socio-economic risk factors are involved in shaping a range of early competences and subsequent outcomes. Early interventions should target multiple dimensions of adversity, instead of single aspects. In particular, support for maternal education and improved housing conditions appears to be vital to support children's early development, reflecting children's need for shelter and cognitive stimulation. In addition, early interventions should focus on the development of multiple competences and skill sets and not just on the development of cognitive skills. Cognitive competences are crucially important, yet it is the combination of different skill sets that matters. We established the significant role of early cognitive and behaviour-regulatory competences in shaping later outcomes regarding education and employment. A child with higher skills in one dimension is, in general, likely to have higher skills in other dimensions too, pointing to spill-over effects. Without behaviour regulation, high-level cognitive skills might be less effective. Moreover, skills build on each other, suggesting cumulative effects over time and processes of developmental integration and cross-fertilisation. Thus, in addition to early interventions, additional support is necessary at later ages, enabling the child to progress, to maintain and advance early skill levels and to acquire new competences. Future research has to examine the complex interlinkages of multiple competences in more detail and identify critical windows of opportunity to support their development over time.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Supplementary Material