

Protecting the development of 5-11 year olds from the impacts of early disadvantage:

The Role of Primary School Academic Effectiveness

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ABSTRACT:

Whether or not more effective schools can successfully mitigate the impacts of early disadvantage upon latter educational attainment remains uncertain in both the Educational Effectiveness and Risk and Resilience research traditions. Here, both fields are drawn upon in a prospective longitudinal investigation of 2,664 children between the ages of 6-11 years who had their academic skills in English and maths along with self regulation measured at ages 6, 7, and 11 years. Experiencing a greater number of early disadvantages between birth to age 5 was found to strongly impair self regulation and academic attainment throughout primary school. However, attending a more academically effective primary school for just a single year was found to partially protect reading, maths, and self regulation outcomes at age 6 from the adverse impact of early disadvantage. Further, more academically effective primary schools were also found to offer an additional longer-term form of protection - they significantly lessened the extent to which earlier abilities in reading, writing, and self regulation predicted these same abilities at age 11. As such, although more academically effective primary schools cannot remove the impacts of disadvantage, the results shown they can make a significant difference to the ultimate academic attainment and self regulation of primary school children who experienced more disadvantages before the start of school and so mitigate their negative consequences.

Keywords: Multiple Disadvantage, Protection, Academic Attainment, Self Regulation, Primary School

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BACKGROUND:

Early disadvantage is well known to have long-term detrimental effects on educational attainment (Power & Matthews, 1997) and although high-quality preschool has been proposed to offer *partial* protection (see elsewhere in this special issue) it is simply implausible to expect preschool provision, no matter how high in quality, to be able to fully mitigate these detrimental effects (Rutter & Maughan, 2002). Rather than investigate solely the effects of preschool, researchers must also ask whether *subsequent* schooling experiences can protect (or indeed compound) as well and if so, then what aspects of school can protect latter child outcomes, how strongly, and under what circumstances?

Considering past research investigating the impacts of early disadvantage on educational attainment, a form of social determinism was posited in the late 1960s and early 70s (e.g. (Coleman, et al., 1966; Jencks, et al., 1972)). Such studies argued that social background was such a strong indicator of future outcomes that whatever education a child might subsequently receive, this simply could not alter the end-result (Sammons, 1999). Such social determinism was always likely to elicit a response and this period saw the emergence of two new traditions concerned with the drivers of child development – One is *School Effectiveness Research* (SER) now subsumed within Educational Effectiveness Research, EER; (Creemers & Kyriakides, 2008) and the second is research investigating *developmental risk and resilience* by integration of sociological life-course theory (e.g. (Elder, 1998; Schoon, 2006)). Both fields sought to differentiate the effects of a child's background from the impacts of day-to-day interactions and processes (Rutter & Sroufe, 2000; Sammons, 1999) and this common interest even generated successful cross-over research (e.g. *Fifteen Thousand Hours* (Rutter, Maughan, Mortimore, & Ouston, 1979)).

Since the emergence of the SER/EER and risk and resilience research traditions, both have continued to investigate whether education can mitigate the impacts of early disadvantage on later educational attainment, to what extent, and by what means. For example, (Luthar, 2006) synthesised the evidence from the field of risk and resilience research and concluded that education-based protection against the impacts of early disadvantage could be achieved through: 1) supportive teacher-child relationships and, 2) classroom environments characterised as more organised, predictable, and supportive of behavioural self-regulation. In contrast, (Mortimore & Whitty, 2000) reviewed past EER literature and concluded that although *school-wide* approaches to mitigating

disadvantage have merit, past research may have exaggerated their compensatory effects (although a major revision by (Scheerens & Bosker, 1997) provided evidence that school effects matter most for the disadvantaged/vulnerable groups). Drawing together the evidence from both fields it is apparent that the effectiveness of schools (rather than the effectiveness of *within*-school features such as teachers and classrooms) for mitigating disadvantage is only weakly supported by the past research concerning both EER and risk and resilience.

Considering the *mechanisms* that may underlie the impacts of disadvantage, both the EER and risk and resilience traditions have shown early disadvantage to impair educational attainment by first delaying development prior to school (Heckman, 2008; Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Hunt, 2008; Yates, Egeland, & Sroufe, 2003). In particular, two areas of early child development have been strongly implicated: early cognition (e.g. pre-reading skills) and early self-regulation (Masten & Coatsworth, 1998; Mortimore, 1995). However, this early *developmental-internalisation* of disadvantage has also enabled researchers to hypothesise one way in which the long-term impacts of disadvantage may be altered (Feinstein, 2003; Sacker, Schoon, & Bartley, 2002). If early cognitive and self regulatory skills can be protected from the impacts of disadvantage then the follow-on impacts for educational attainment might also be avoided (A. Goodman & Sianesi, 2005; Hayes, 2006).

Although such research goes some way towards questioning historic notions of educational social determinism, both the EER and risk and resilience research traditions have faced criticism. In particular, the early research of both fields was criticised for the measurement techniques each employed (Burchinal, Roberts, Hooper, & Zeisel, 2000; Sammons, 1999) and both fields faced criticism for neglecting to take into consideration the hierarchical nesting of factors known to drive development (Cicchetti & Curtis, 2007; Creemers, Kyriakides, & Sammons, 2010). Partially in response, today both fields now emphasise a hierarchy of interacting factors that shape development (commonly adopting (Bronfenbrenner, 1986)) and both seek to document the processes which underlie the developmental impacts of early disadvantage and effective education (Leonard, Bourke, & Schofield, 2004; Luthar & Brown, 2007; Masten, 2007). However, the life-span of findings from such prior-research is limited by the continual development of the underlying theoretical models of child development and this limitation is exacerbated when applied to continually evolving educational policies and models of delivery (e.g. (Berliner, 2002; Vanderlinde & van Braak, 2010)). It is in response to this past research and the educational contexts within which this has been applied that this paper seeks to examine how far the quality of the primary school

attended (measured in terms of indicators of academic effectiveness) can protect against the adverse effects of early childhood disadvantage. The following relationships are here examined:

1. Children's academic attainment and self regulation between 6-11 years
2. The developmental impact of multiple early disadvantages
3. Whether the developmental impact of experiencing a greater number of early disadvantages was lessened for those who attended more academically effective primary schools

METHOD:

Sample

The Effective Preschool, Primary, and Secondary Education (EPPSE) is a longitudinal cohort study that has used an educational effectiveness design to study the impact of education on the development of over 3,000 children from age 3 years onwards. With the EPPSE sample of children currently aged 16+ years, a more detailed description of this sample can be found elsewhere in this special issue as well as in (Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, Hunt, et al., 2008; Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004). This paper studies those 2,664 children for whom EPPSE collected information concerning academic attainment at the end of primary school (Key Stage 2, at age 11 years). Here, we discuss the results of a multilevel Structural Equation model (a form of value-added statistical analysis) that allowed us to test the hypothesis that more academically effective primary schools could lessen the adverse developmental impact of experiencing multiple (early) disadvantages on child outcomes measured over-time at ages 6, 7, and 11 years.

Measures

Birth-Age 5 Years:

The EPPSE project recruited a initial sample of 2,857 children and families (after informed parental consent) from 141 preschools of six different types that were spread across five English regions during the period: January 1997-April 1999 (Sylva, et al., 2004; Sylva, Sammons, Melhuish, Siraj-Blatchford, & Taggart, 1999). Children received a baseline assessment of their cognitive and social development within 10 weeks of their entry into the study (at mean age: 3 years 3 months). This sample of preschool attendees was supplemented by the further recruitment of 315 'home' children who had received no (or minimal) preschool experience by school entry (rising 5 years). For both groups of children and families the EPPSE team collected retrospective demographic data as well as information concerning day-to-day learning activities carried out between parents and 3-5 year old

children (termed the 'Home Learning Environment', HLE; (Melhuish, Phan, et al., 2008)). Both sources of data (demographics and HLE) were then used to construct an Index of Multiple (early) Disadvantage (IMD) - a measure that was based on prior work which informed the construction of Educational Priority Indices (EPI; (Sammons, Kysel, & Mortimore, 1983). Further demonstrating the similarity of EER and risk and resilience research, both the IMD and EPI are measures of disadvantage which closely resemble 'Indices of Cumulative Risk' (see (Hall, et al., 2010)). The IMD counts the incidence of the following ten measures: 1. First language spoken (not English). 2. Large family (> two siblings). 3. Prematurity or low birth weight (<36 weeks gestation or <2,500 grams). 4. Maternal qualifications (none). 5. Father occupation (<semi-skilled). 6. Father employment (never employed). 7. Maternal age (<17 years). 8. Marital status (lone parent). 9. Mother employment (never worked or unemployed). 10. Home Learning Environment (bottom quartile).

Age 6 Years:

At the end of their first year of primary school (at child age 6 years) the EPPSE sample of children (preschool attendees and 'home' children) received follow-up assessments measuring their academic attainment and their social/behavioural skills (Sammons, et al., 2004a). Here we examine standardised assessments of children's attainment in reading (NFER-Nelson Primary Reading Level 1; (France, 1981)) and mathematics (Maths 6 Test; (Hagues, Caspall, Clayden, NFER-NELSON, & Patilla, 1997)), together with children's self regulation as assessed with the teacher version of the Strengths and Difficulties Questionnaire (SDQ; (R. Goodman, 1997)).

Age 7 Years:

One year after receiving researcher-rated standardised assessments of cognition and self regulation, the EPPSE sample of children completed Key Stage 1 of the UK national curriculum and undertook teacher-rated national assessments of academic attainment in reading, writing, and mathematics (National Assessment Agency, 2008; Qualifications and Curriculum Authority, 2008). The EPPSE team subsequently obtained this information on academic attainment and supplemented these data on academic attainment with the repeated assessment of social/behavioural skills - again using the teacher version of the SDQ (Sammons, et al., 2004b). Here, children's abilities in reading, writing, and mathematics are examined alongside levels of self regulation.

Age 11 Years:

Following on from the teacher assessments of children's academic attainment and social/behavioural skills at the end of Key Stage 1 (age 7 years), children began Key Stage 2 of the UK national curriculum which they experienced for the next four years (until child age 11 years). Key

Stage 2 ended with another round of national assessments of children's academic attainment (English and maths) and the EPPSE team once again asked teachers to assess the social/behavioural skills of children using the teacher-rated SDQ (see (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2008)). Here, children's age 11 attainment in English and mathematics are examined in addition to age 11 self regulation.

Finally, as well as collecting information on children's academic attainment and behaviour at age 11 years, Key Stage 2 also saw the EPPSE team derive contextualised value-added indicators of the academic effectiveness (in English, Maths, Science) of each primary school that their sample of children attended - schools for which most children had attended since age 5 (see (Melhuish, et al., 2006)). To derive these three measures of academic effectiveness, the EPPSE team separately analysed nested assessment data for 540,000 school children within 15,000 British primary schools while controlling for prior attainment and underlying disadvantage due to characteristics of the *child* (e.g. gender differences), *family* (e.g. poverty), and/or *neighbourhood* (e.g. school composition)(Melhuish, Sylva, et al., 2008).

Analytic Approach

Multilevel Structural Equation Modelling (SEM) was used to reveal the 'total' developmental impact of multiple early disadvantages in a *value-added* statistical examination of the EPPSE children's development between the ages of 6-11 years (see Figure 1). The statistical effects associated with disadvantage are referred to as 'total' effects because they are composed of a 'direct' effect plus the total of all 'indirect' effects that operate via impacts to development that occurred at younger ages. For example, Figure 1 shows self regulation at age 7 to be predicted by earlier multiple disadvantage both *directly* and also *indirectly* via earlier impacts on both self regulation and academic skills at age 6. Figure 1 also illustrates that the academic effectiveness of primary school was hypothesised to alter the direct and indirect developmental impacts of disadvantage (via the associations shared between attainment and self-regulatory behaviour over time).

Insert Figure 1 here

Prior to conducting the SEM illustrated in Figure 1, a preliminary investigation was carried out into the potential consequence of children's cross-classified nesting within both pre- and primary schools. The design effect of both nestings on all measures of child attainment and behaviour between 6-11 years that are included in this analysis was estimated following (Muthén & Muthén, 2007) and using the formula: *Design Effect* = $1 + (\text{average cluster size} - 1) * \text{intraclass correlation}$. Again, the guidelines of Muthén and Muthén (*ibid*) were followed stating that any obtained design

effect greater than 2 necessitated accounting for via multilevel modelling. With an average cluster size of 20.26 children per preschool and 3.08 children per year 2 primary school classroom, it was only preschool nesting that led to design effects that exceeded the threshold value. This finding was unsurprising given that the original sample of children recruited by EPPE were drawn from the attendees of 141 preschools (Sylva, et al., 2004) but where children who moved on to a total of 767 primary schools by the end of primary school year 1 (Sammons, et al., 2004a). In response to these results, the SEM of Figure 1 was modified to take into account children's nesting within preschools *only*. The standard errors of all statistical relationships were appropriately modified in an multilevel regression approach referred to as 'aggregated modelling' (see (Asparouhov, 2005)). Thus, although this analysis does not control for pre-school quality *explicitly*, it does control for the clustering effects related to the individual preschool attended – an effect that includes influences of preschool quality (Sammons, et al., 2004a).

The analysis of this paper accounted for potential non-normality in the distribution of variables through use of the Robust Maximum Likelihood estimation procedure while missing data was imputed using the reliable (Wiggins & Sacker, 2002) Full Information Maximum Likelihood method. By including pre-school as the level 2 structure we control for the effects of pre-school that are known to be significant from other analyses (see elsewhere in this special issue) so that we can address solely primary school.

RESULTS:

Descriptive Statistics

Table 1 examines the 3,172 children originally recruited to take part in the EPPE research and compares those who were studied in this investigation (n=2,664) against those who were not (n=508). The inclusion criteria for this study was whether or not the EPPE project had a record of each child's academic attainment (in English and Maths) at age 11 years (at the end of Key Stage 2). Table 1 compares these two groups of children (Included vs. Excluded) on the measures of disadvantage and child development that are here reported. These results indicate that although the children for whom both age-11 tests of English and Maths were available experienced no fewer early disadvantages, they did have significantly greater academic skills and self regulation since at least the end of year 1 at primary school (at age 6 years).

Insert Table 1 here

Structural Equation Modelling

Descriptive Results

The SEM of Figure 1 was implemented in a two-stage procedure. First, all direct and indirect effects were estimated to the exclusion of statistical interaction terms and this model strongly fitted the data (CFI=0.998; RMSEA=0.022; AIC=82,880.10; BIC=83,451.20). Second, the various statistical interaction terms (*effectiveness x disadvantage*; *effectiveness x development*) were then added to this model and this prevented the estimation of the probability of the indirect effects. This second and more complicated model also prohibited the return of absolute indices of model fit (χ^2 , CFI, RMSEA). Nonetheless, the inclusion of the interaction terms that are illustrated in Figure 1 was found to make very little difference to the overall fit of the model according to the comparative fit indices. Both the AIC and BIC returned similar values when the statistical interaction terms were included in the statistical model (AIC= 84,133.05 (within 2%); BIC=84,927.88 (within 2%)). This gives confidence that the final specified model (and thus the results obtained) are true to the measured data.

The latent measure of global primary school academic effectiveness that was specified as part of the analysed Structural Equation Modelling was significantly reflected in all three of the contextualised value-added indicators of primary school academic effectiveness created by the EPPSE team. Academic effectiveness *in science* and *in maths* were both strongly (and similarly) reflective of the overall academic effectiveness of schools (standardised factor loadings of 0.83, $p<0.001$ and 0.81, $p<0.001$ respectively). By comparison, academic effectiveness *in English* reflected overall academic effectiveness to a lesser extent (standardised factor loading of 0.59, $p<0.001$). Further, This variation is also consistent with past studies in the EER tradition that have linked larger school effects with subjects that are primary taught in school such as mathematics and science (Creemers & Kyriakides, 2008; Scheerens & Bosker, 1997; Teddlie & Reynolds, 2000).

Table 2 shows the statistical associations that were shared between measures of self regulation and levels of children's attainment in maths and English over time. The strong statistical associations that can be observed between repeated assessments (in **bold**) reflects the high degree of auto-regression that is a common feature of repeated measurement (Thornton & Gilden, 2005). In turn, this high degree of auto-regression provides a means by which early disadvantage can have additional 'indirect' effects on development. Because early developmental abilities so strongly predict development into the future, so the impacts of disadvantage on these early developmental abilities are likely to provide a means for the impacts of early disadvantage to continue over-time and to be exacerbated. In other words, the impact of early disadvantage may become internalised

and so continue to have long term effects by altering the subsequent trajectory of development (though other mechanisms may also be in-play).

Insert Table 2 here

Developmental impacts of multiple early disadvantages

As mentioned above, early disadvantage may be hypothesised to impact developmental outcomes in two possible ways. As well as direct effects, early disadvantage may have additional *indirect* effects by becoming internalised within the child's development due to the high degree of association that is shared amongst developmental measures over time (see Table 2). The combination of the direct and the (sum total) indirect effects on any one outcome is commonly referred to as the 'total' impact (e.g. (Marsh & O'Mara, 2010)). Figure 2 illustrates both types of impact that early disadvantage may have on children's self regulation and academic attainment between the ages of 6 to 11 years.

Figure 2 shows that by age 7 years, there was no longer a significant direct effect of early disadvantage on children's self regulation ($B=0.01$ SDs, $p>0.05$) whereas such effects remained evident for attainment in both mathematics ($B=0.04$ SDs, $p<0.05$) and reading ($B=0.05$ SDs, $p<0.05$). Indeed, this disparity over the duration of the direct effects of early disadvantage on academic skills rather than self-regulatory behaviour even remained evident at age 11 years. Figure 2 shows that the direct impact of early disadvantage on both mathematics ($B=0.04$ SDs, $p<0.05$) and English measured at age 11 years remained significant ($B=0.04$ SDs, $p<0.05$) whereas the direct effect on self regulation had disappeared ($B=0.00$ SDs). Together, these findings suggest that the developmental impacts of early disadvantage on self regulation might be being internalised at an earlier age than are the equivalent impacts on children's attainment in either mathematics or English.

Insert Figure 2 here

Universal Boosts from Primary School Academic Effectiveness

Direct universal boosts (main effects) from attending a more academic effective primary school were found for all children's outcomes measured at ages 6 and 11. At age 6 years, direct significant effects were found on the absolute levels of all children's self regulation ($B=0.12$ SDs, $p<0.001$), mathematics ($B=0.11$ SDs, $p<0.001$), and reading ($B=0.18$ SDs, $p<0.001$). Further, although no additional promotion was evidenced at the end of the next school year (age 7), universal boosts were again noted at age 11 in children's attainment in maths ($B=0.13$ SDs, $p<0.001$) and English ($B=0.12$ SDs, $p<0.001$). These results suggest more academically effective primary schools offer two

types of universal promotion: First, an early boost at the end of the first year of school and which is evident on both academic skills and self regulation. Second, an additional later boost that is evident at the end of primary school, but which only remains evident on attainment (for more EPPSE results on the main effects of primary school academic effectiveness see (Anders, et al., 2010; Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, Barreau, et al., 2008)).

Direct Protective Effects of Primary School Academic Effectiveness

In addition to universal boosts to all children's academic skills and self regulation, more academically effective primary schools were found to offer four additional 'protective' effects that went some way towards mitigating the impacts of early disadvantage: three such effects were evident after the first year of school (at child age 6 years) and one was evident at the end of primary school.

By the end of the first year of school, attending a more academically effective primary school was found to significantly reduce the impacts of early disadvantage on children's maths (*risk x effectiveness*: $B = -0.20$ SDs, $p < 0.05$), reading (*risk x effectiveness*: $B = -0.17$ SDs, $p < 0.05$), and self regulation (*risk x effectiveness*: $B = -0.17$ SDs, $p < 0.05$). Although experiencing more disadvantages between 3-5 years was associated with significantly poorer maths, reading, and self regulation at age 6 years, these negative relationships were diminished if children had attended a more academically effective primary school during their first year in primary school. Further, this partially protective effect remained evident at exit from primary school (end of Key Stage 2) when children were age 11 years. Although experiencing a significantly greater number of disadvantages before school entry continued to negatively impact attainment and self regulation (as would be expected), the direct impacts on children's English attainment was reduced for students that had attended a more academically effective primary school (*risk x effectiveness*: $B = -0.05$ SDs, $p < 0.05$).

Indirect Protective Effects of Primary School Academic Effectiveness

In interpreting our results we argue that reducing the strength of the association between developmental measures over-time reflects a lessening of the long-term indirect impacts of early disadvantage on child development. This claim is based upon two sets of results so far reported: First, the strong association between measures of development assessed at 6 to 11 years (see Table 2) and second, the significant impact of early disadvantage on age 6 academic skills and self regulation (see Figure 2). Given this background of relationships, three significant indirect protective effects were identified. First the significant association between age 6 reading and age 7 reading ($B = 0.36$, $p < 0.001$) and writing ($B = 0.28$, $p < 0.001$) was reduced for children who had attended a more academically effective primary school over these two years (year 2 reading: $B = -0.07$, $p < 0.01$;

year 2 writing: $B=-0.08$, $p<0.01$). Second, the association between children's self regulation at the end of year 2 and year 11 of primary school ($B=0.30$, $p<0.001$) was also significantly reduced for those children who attended a more academically effective primary school ($B=-0.07$, $p<0.05$). These results suggest that the negative impact on their cognitive and social outcomes that might otherwise be expected of children with poorer early academic and self regulatory skills can be ameliorated by attendance at a more academically effective primary school.

DISCUSSION:

Developmental impacts of early disadvantage

We found that children who experienced multiple early disadvantages between birth and age 5 years were more likely to have significantly lower academic and self regulatory skills throughout primary school (to age 11 years, see Figure 2). However, in this study we also identified significant variations to the impacts of disadvantage on both academic skills and self regulation. In particular, the *direct* impacts of experiencing early multiple disadvantages on self regulation faded to insignificance at an earlier age than did the direct impacts on later academic attainment in English or maths. Conversely however, the *indirect* effect (thereby also the *total* effect) of disadvantage on self regulation remained constant at ages 7 and 11 while the academic effectiveness of primary schools offered no universal boosts nor direct protection to self regulation at either of these ages. Thus, although experiencing multiple early disadvantages is likely to lead to longer-term impacts on academic attainment in English in maths, it is the impacts of disadvantage on self regulation during Key Stage 1 which should be of particular concern as it is harder for primary schools to lift these skills as children age (a difficulty consistent with past results such as those of Hall et al., reported elsewhere in this issue).

Universal Boosts from Primary School Academic Effectiveness

More academically effective primary schools were found to offer universal boosts to the academic and self regulatory skills of all children (on average) at two separate time-points. By the end of the first year of primary school, more academically effective primary schools offered significant boosts to all children's attainment in reading and maths as well as to self regulation. Five years later (at child age 11 years), more academically effective primary schools were found to offer further universal boosts over and above those initially offered at age 6 years. However, at age 11 these additional universal boosts were only noted for children's academic attainment in English and maths and not for self regulation. When this lack of a long-term boost to self regulation is considered

alongside the persistent impacts of early disadvantage on self regulation, once again an emphasis is apparent on ensuring that young children's self regulation (during pre-school and Key Stage 1) is supported and encouraged as strongly as possible.

Direct Protective Effects of Primary School Academic Effectiveness

Attending a more academically effective primary school throughout Year 1 was found to be of especial benefit to those children who had experienced a greater number of early disadvantages between birth and age 5 years. Although early disadvantage was still linked to significantly lower academic skills and self regulation at age 6 years, this association was significantly reduced for children who now attended a more academically effective primary school. In particular, the partial protection of self regulation at age 6 years is especially important when considered alongside the lack of later additional universal boosts or direct protection for self regulation – effects that can be found for academic attainment in English and maths upon exit from primary school at age 11 years. One implication of these results is that an early concentration by schools and teachers on fostering children's self regulation is likely to support their later learning.

Considering the implications of these findings in more detail, the comments of (Mortimore & Whitty, 2000) when summarising the results of *Fifteen Thousand Hours* (Rutter, et al., 1979) provide a cautious starting point, *"if all schools performed as well as the best schools, the stratification of achievement by social class would be even more stark than it is now"*. Later research has however questioned this claim by indicating that school effects tend to be larger (for good or ill) for disadvantaged groups (Scheerens & Bosker, 1997). Moreover, this notion that pushing for improvement in schools may worsen rather than lessen the divide between those who experienced greater rather than fewer early disadvantages assumes that there is no minimum *baseline* of academic attainment that all children should be supported in reaching. If one instead accepts that a central aim of education is for all children to reach a certain minimal level of academic attainment so as to facilitate life chances then boosting the more able along with the disadvantaged can still constitute protection against disadvantage. Further, whether or not such effects may be said to infer protection is a debate also present within the field of risk and resilience research. For example, while (Luthar, 2006) does use the term 'protection' for such effects, (Sameroff, Gutman, & Peck, 2003) instead refer to this as 'promotion'. By contrast, in circumstances where the disadvantaged catch-up to the advantaged it is Sameroff who now uses the term 'protection' while Luthar instead uses the term, 'protective-stabilization'.

Indirect Protective Effects of Primary School Academic Effectiveness

Our results demonstrated how the developmental impact of experiencing multiple early disadvantages may become internalised thanks in part due to the strong association of earlier to latter levels of development. Our results suggest that by lessening such longitudinal associations more academically effective primary schools are able to offer additional *indirect* protection to the English and self regulatory skills of children who experienced more disadvantages before the age of 5 years. This indirect protection was evidenced by three sets of results. First, we found clear evidence that early disadvantage directly reduced average levels of reading, writing, and self regulation before age 7 (Figure 2). Second, these (on average) disadvantage-reduced levels of academic and self regulatory skills were then strongly predictive of the same future skills at exit from primary school at age 11 years (Table 2). Thirdly primary schools that were identified as more academically effective were able to significantly lessen the extent to which these measures of development were associated with one another. Finally, this evidence of indirect protection was found alongside further effects evidencing both direct partial protection and universal boosts.

This study extends current knowledge about the links between equity and effectiveness that are a long-standing focus of much EER. The results illustrate that attending an academically effective primary school has benefits for all students by may have especial importance in boosting outcomes for disadvantage groups (i.e. offers some protection against the adverse impacts of disadvantage experienced in the birth-preschool period). It also demonstrates the importance of both direct and indirect effects in shaping children's developmental and academic trajectories across their primary school career (age 6-11).

The findings suggest that policy makers and practitioners should focus on promoting the academic effectiveness of primary schools for all children but especially those serving disadvantaged communities. In addition, they suggest that teachers and parents should seek to promote young children's self regulatory behaviour from an early age (through high quality preschool and early home learning environments as well as in the first years of primary school).

Strengths and Limitations

The major limitation of this paper is that no data were available for identifying the mediating processes and structures within the school and teaching environments that facilitate the significant relationships here noted. In other words, although attending a more academically effective primary school was found to reduce the impact of experiencing multiple early disadvantages, it yet remains important to identify the intervening and possibly causal teacher, classroom, and teacher-pupil effects (as advocated in (Kyriakides & Creemers, 2008)). By contrast, the major strength of this

paper comes directly from its integration of EER and risk and resilience research. While EER has a long history of investigating which background factors are more important for educational attainment (Sammons, 1999), risk and resilience research has instead adopted an originally epidemiological approach to this matter - arguing that it is the *volume* of background factors that must be considered, not any one factor or set of factors in particular (i.e. cumulative risk indices; see (Sameroff, et al., 2003)). Here, we brought across the notion of multiple disadvantage in terms of *cumulative risk* (though an equivalent notion can also be found in early EER; e.g. (Sammons, et al., 1983)) to our study of educational effectiveness. Elsewhere we have made comparisons between the relative severity of different individual risk factors (Anders, et al., 2010; Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, Hunt, et al., 2008).

Another limitation to this study was that the impacts of early developmental risks need not only be carried over time via internalisation within a child's developmental abilities. A very real additional mechanism is that the impediment of early developmental outcomes may alter subsequent teachers' expectations of a child. A child who does less well early-on may not be encouraged to perform at the same level as children who initially performed better. However, the possibility and magnitude of such relationships will only truly be explored by teacher-child interaction research.

Conclusions

As Basil Bernstein noted 40 years ago, "*Education cannot compensate for society*" (Bernstein, 1970) and this a sentiment that has since been carried forward within both the EER and risk and resilience research traditions. For example, this statement is echoed within comments such as, "*School effectiveness is... not a panacea for all educational ills*" (Sammons, 1999) and, "*It is implausible that schools could eliminate all effects of family experiences during the preschool years...*" (Rutter & Maughan, 2002). Nonetheless, what this paper has shown is that more academically effective primary schools can make a significant difference to the academic attainment and self regulation of children who experienced more disadvantages early on in life (before age 5 years). In particular, significant effects were noted on children's self regulation and English where the partially protective effects of attending a more academically effective primary school were found to be longest-lasting. Thus we can conclude that schools have the potential to ameliorate the impact of disadvantage and thus improve educational outcomes and potentially later life chances for disadvantaged groups.

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Table 1. Sample description and comparison of age 11 participants vs. excluded

Measure	<i>Included</i> (max n= 2664) ^a		<i>Excluded</i> (min n=508)		<i>P</i> *
	Mean ± SD	(n)	Mean ± SD	(n)	
Index of Multiple (early) Disadvantage	1.82 ± 1.50	(2448)	1.83 ± 1.58	(451)	0.853
Age 6 Reading	20.45 ± 6.74	(2322)	19.26 ± 9.01	(372)	0.016
Age 6 Mathematics	18.97 ± 5.15	(2317)	17.08 ± 7.20	(368)	<0.001
Age 6 Self Regulation	2.33 ± 0.51	(2269)	2.14 ± 0.61	(359)	<0.001
Age 7 Reading	2.47 ± 0.66	(2144)	2.15 ± 1.02	(293)	<0.001
Age 7 Writing	2.35 ± 0.60	(2091)	1.97 ± 1.04	(283)	<0.001
Age 7 Mathematics	2.51 ± 0.57	(2104)	2.26 ± 0.89	(288)	<0.001
Age 7 Self Regulation	2.39 ± 0.49	(2046)	2.20 ± 0.58	(328)	<0.001
Age 11 English ^b	100.19 ± 14.87	(2664)	81.19 ± 15.99	(27)	<0.001
Age 11 Mathematics ^b	100.22 ± 14.92	(2664)	83.96 ± 12.08	(37)	<0.001
Age 11 Self Regulation	0.05 ± 0.97	(2327)	-0.36 ± 1.10	(337)	<0.001

* All results obtained from independent sample t-tests

^a Values less than n=2664 indicate missing data

^b Internally age standardised and normalised

Table 2. Measures of development form 6-11 years: Relationships between self regulation and academic attainment in mathematics and English (z-scored unstandardised beta effects, B)

	Age 7 Years:				Age 11 Years:		
	Self Regulation	Maths	Reading	Writing	Self Regulation	Maths	English
Age 6 Years:							
Self Regulation	0.50***	0.18***	0.22***	0.23***	0.13***	0.02	0.05*
Maths	0.18***	0.49***	0.34***	0.37***	0.11***	0.21***	0.06*
Reading	0.13***	0.20***	0.36***	0.25***	0.01	0.03	0.07**
Age 7 Years:							
Self Regulation					0.30***	0.15***	0.18***
Maths					0.07**	0.37***	0.00
Reading					0.18***	0.20***	0.39***
Writing					0.00	0.08*	0.14***

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

Figure 1. Structural Equation Model testing the developmental impacts of pre-school period multiple disadvantage and primary school academic effectiveness

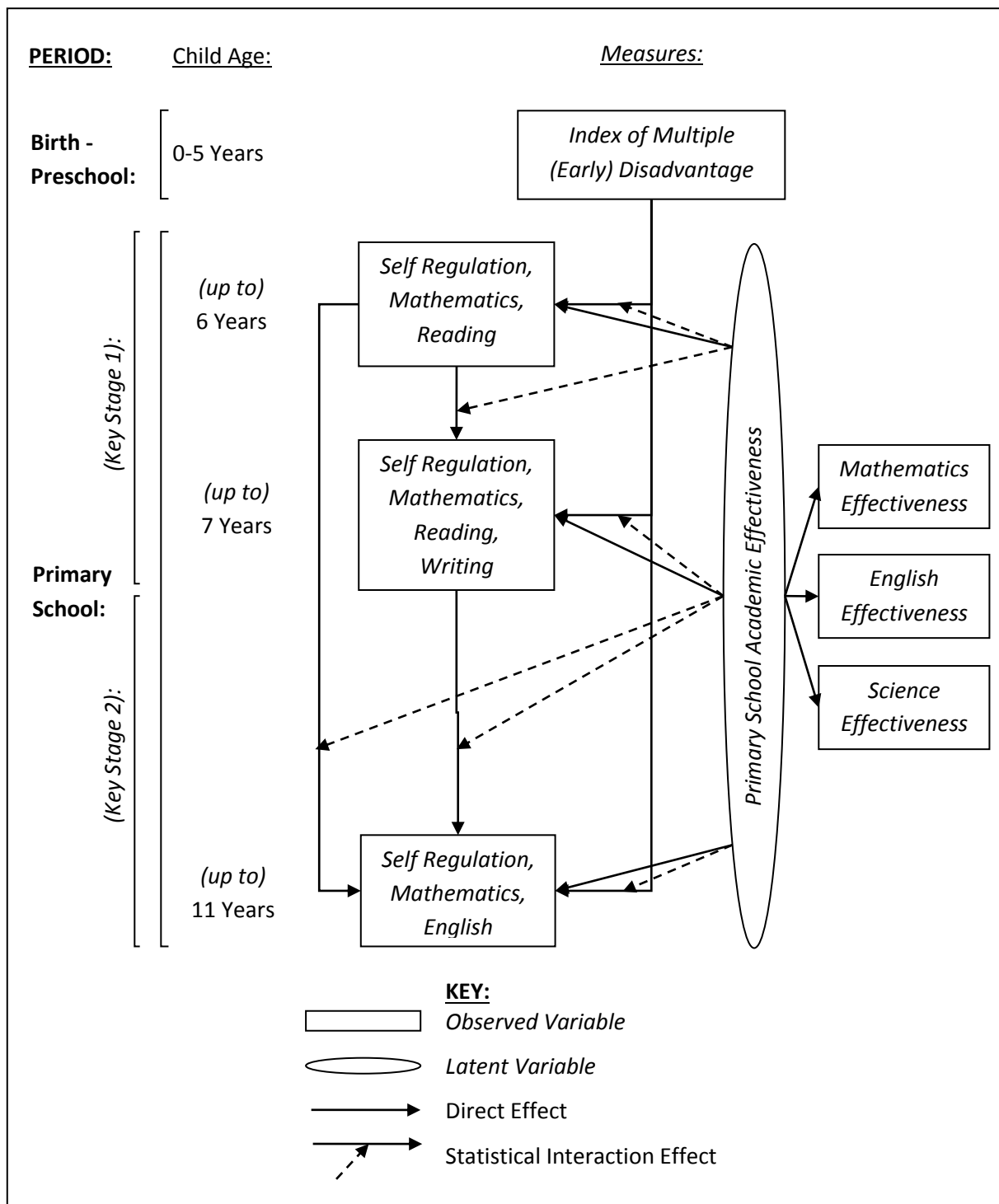
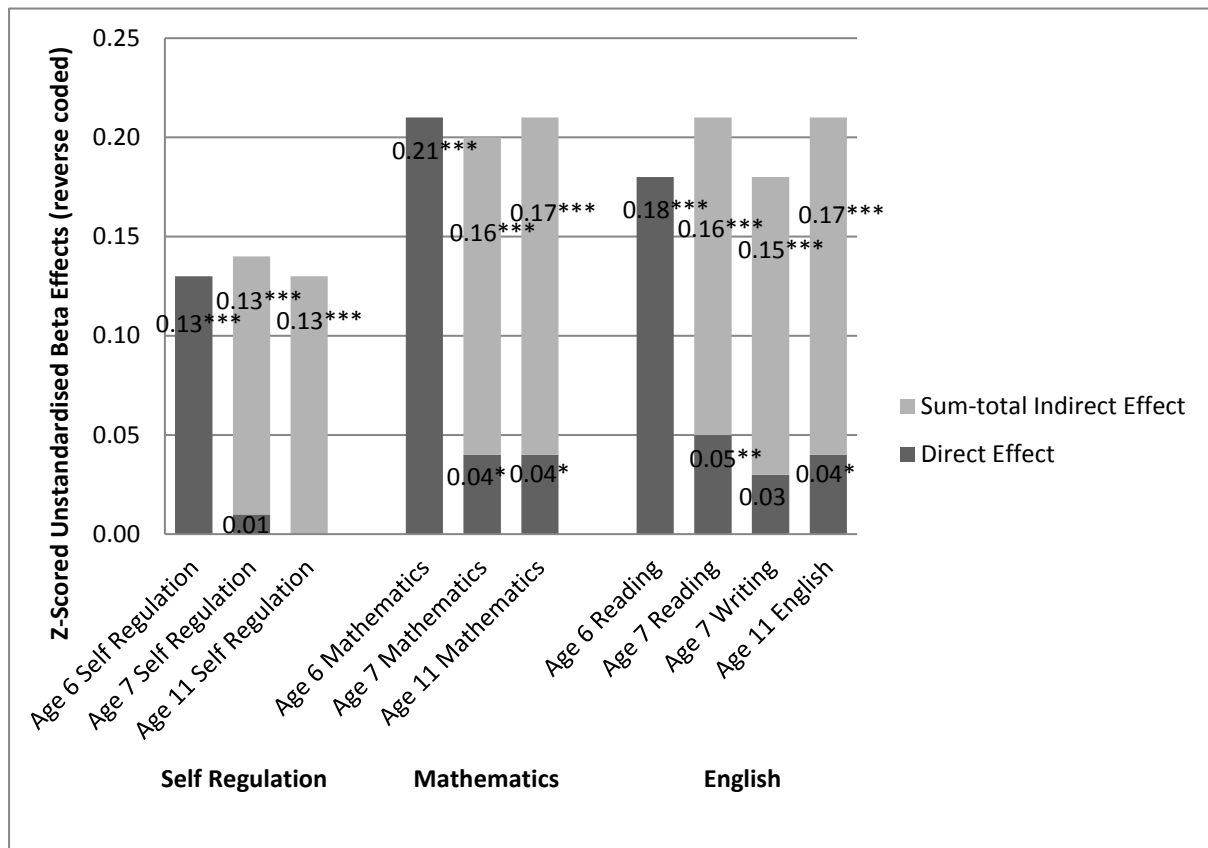


Figure 2. The 'total' impacts of multiple early disadvantages on children's self regulation and academic attainment at different ages (6, 7, and 11 years)



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