Can pre-school protect young children's cognitive and social development? Variation by center quality and duration of attendance

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ABSTRACT:

This paper illustrates how high quality universal pre-school has the potential to serve as an intervention within normal populations. Although it is well known that targeted Early Interventions can protect the development of young children from the impact of developmental risks, there remains less clear evidence concerning universal programs of pre-school. To address this disparity, a longitudinal secondary analysis was conducted that examined the psychological development of 2,862 English pre-schoolers between the ages of 3 to 5 years. At age 5, instances of significantly protected development were more strongly evidenced when examining: 1) cognitive rather than social development, 2) child-level rather than family-level risks, and 3) the quality of the processes taking place within pre-schools rather than just the structures. Finally, for pre-schools that featured only high quality structures, any partial protection of development was limited to instances of longer durations of child-attendance.

Keywords: Child Development, Pre-school Quality, Multiple Disadvantage, Risk, Protection

Can pre-school protect young children's cognitive and social development?: Variation by center quality and duration of attendance

BACKGROUND:

If programs of early education and care (typically *'pre-school'* for the over threes; Melhuish, 2004; Sammons, Anders, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Barreau, 2008) can mitigate the impacts of developmental risks in young children's lives, then these programs could be considered a type of *early prevention* of the detrimental developmental outcomes common to children who experience high-levels of such risks (Masten & Gewirtz, 2006). Although the *Early Intervention* that this prevention would be equivalent to (Sammons et al., 2004) has been well demonstrated in intensive and explicit programs of Early Intervention (e.g. the Ypsilanti/High Scope/Perry Pre-school Study, see Melhuish, 2004; Abecedarian Project, see Rutter and Rutter, 1993), equivalent evidence is much weaker when considering the universal programs of pre-school (NICHD, 2000). Further, there remains a need to address this gap in research because young children are much more likely to experience programs of pre-school rather than an Early Intervention (Peisner-Feinberg, 2004).

Previous attempts aimed at unraveling whether universal programs of pre-school education can protect development have drawn on findings from the two most salient fields of academic research: 'developmental psychopathology' and 'early education'. For example, Borge, Rutter, Cote and Tremblay (2004) argued that*, "Perhaps, it* [universal pre-school] *could compensate to a degree for marked family adversity"*. Further, Luthar (2006) reported a need for researchers to go beyond measuring the *'quality' of the structures* within pre-schools (e.g. carer-to-child ratio, staff qualifications) to instead consider also the *'quality' of the processes* (e.g. staff-child relationships). This same year also saw Schoon (2006) comment that, *"Most research on resilience has focused on middle childhood and adolescence, while early childhood is a less researched period*".

Around the same time that these commentaries were being made from researchers concerned primarily with *developmental psychopathology,* the issue of whether pre-school can protect development was also been commented upon by those concerned mainly with *early education*. For instance, Melhuish (2004) reviewed the developmental impacts of early education and care and was explicit in articulating the question addressed by this paper, *"In what ways might early years provision be used for early intervention with children at high risk for developing special needs both intellectual and behavioural?"* Further, Peisner-Feinberg (2004) noted that the studies which had examined the developmental impacts of programs of pre-school (as of 2004) were limited in their longitudinal focus when compared to Early Interventions.

Peisner-Feinberg (2004) also provided an overview of past attempts that had been made to address whether pre-school could protect development (Burchinal, Peisner-Feinberg, Bryant and Clifford, 2000; Hagekull and Bohlin, 1995; NICHD, 2000; Peisner-Feinberg and Burchinal, 1997; Peisner-Feinberg et al., 2001). Considering the findings of all these studies, Peisner-Feinberg was able to conclude that only *inconsistent* benefits of pre-school attendance had been returned when concerning the development of high-risk children and that some studies had even failed to provide any evidence in support of this conclusion at all.

Considering just two of the studies reviewed by Peisner-Feinberg in greater detail and beginning with Burchinal, Peisner-Feinberg, Bryant and Clifford (2000), these authors examined the social and cognitive development of young children and analyzed whether both were partial functions of background risks (including: child gender, ethnicity, family poverty, and parental values) and/or pre-school qualities. This investigation was argued to be the first to have sampled enough children whose development was 'at-risk' (1,000+) to reliably establish protection. Using measures of the overall-quality of both structures and processes within pre-schools, only a single instance of protected development was found. The language development of young children from ethnic minority backgrounds was partially-protected when these children had attended pre-schools of higher overall quality. Suggesting reasons for this limited evidence of protection, Burchinal and colleagues proposed that their study had lacked sufficient detailed information about the families and the qualities of the pre-schools that the young children had attended.

Perhaps the most important previously conducted investigation into whether universal pre-school can protect the development of young children was that conducted by the National Institute of Child Health and Human Development (NICHD; 2000) Early Child Care Research Network (ECCRN). Not only was the paucity of previous research mentioned as a driving factor behind their investigation, but so to were the limited *scope* of the risks that had been previously studied. Despite investigating a smaller sample of 943 young children (when compared to the paper of Burchinal and colleagues, 2000) the NICHD still sought to address gaps in the pre-existing research literature. In particular, three types of *'Family risk factors'* (psychosocial, socioeconomic, and sociocultural) were studied alongside measures of the quality of the *processes* that took place within the sampled pre-schools. However, like the Burchinal study, the NICHD also found only limited evidence of protected development, a finding that they referred to as, *"contrary to expectations"* and which was partly attributed to an insufficient combination of severe risks with higher quality pre-schools.

In response to such previous research this paper builds upon past findings and presents the results of a large-scale study that aimed to determine if the quality of pre-school programs (particularly high quality rather than low) could protect the cognitive and social development of a broadly representative sample of young English children (for fully-detailed results, see Hall, 2009; Hall et al, 2009, 2010). Given the current extent of the literature concerned with whether pre-school can protect the development of children, there was a need to consider the results of this study in their entirety as well as the associated implications. Aimed at addressing the limitations of previous research, this longitudinal secondary analysis adopted a broad remit with an examination of:

(1) The cognitive and social skills of 2,862 young children between 3-5 years

(2) Child- (ecological) level and family-level risks

(3) The quality of the processes and structures within 141 pre-schools

(4) The varying lengths/durations that young children attended their pre-schools

METHOD:

Sample

To conduct an investigation (of broad remit) into whether universal programs of pre-school education could protect young children's cognitive and social development, a reanalysis was conducted of the (anonymized) longitudinal data collected by the Effective Provision of Pre-School Education project (EPPE; see Sylva, Melhuish, Sammons, Siraj-Blatchford and Taggart, 2004). This was a longitudinal English study that began in 1997 with the aim of investigating the effects of pre-school education and care on the development of young children between the ages of 3 and 7. Five geographical regions (representative of England) were sampled and covered urban, rural and sub-urban areas. From these areas, 141 pre-schools were then randomly selected. The qualities of the processes and structures within the 141 programs of universal pre-school were assessed and the development of a randomly-sampled selection of children was measured (after informed consent was obtained from parents). Further details of the EPPE research design and methodology are given in Sammons, Siraj-Blatchford, Sylva, Melhuish, Taggart, and Elliot (2005) and Siraj-Blatchford, Sammons, Sylva, Melhuish, and Taggart, (2006). The final sample for this analysis consisted of 2,862 pre-school attendees (see Sylva et al., 1999).

Applying the terminology of 'developmental psychopathology', the young pre-school attending children had 21 recorded potential *risks* to their cognitive and social abilities measured when they were, on average, 36 months of age. Development was measured at this age (36 months) and again when these children were, on average, 58 months.

The remaining measures (pertinent to this study) were: a single measure of the global/overall quality of the EPPSE pre-schools, five indicators of the quality of processes, and seven indicators assessing structures. So as to properly assess the impact of these qualities, the EPPE project also measured the duration that each child was in attendance at their pre-school.

Measures

Cognitive and social development

When they entered the EPPE study (at mean age 36 months) each child had their cognitive abilities assessed by trained researchers using the British Ability Scales (BAS; Elliot, NFER-NELSON, Smith and McCulloch, 1996) to return a measure of General Cognitive Ability (GCA). These scales were again used when children began primary school at mean age 58 months and these again returned a measure of GCA (with both having been shown to be reliable and consistent age-appropriate assessments).

Social development was measured shortly after the pre-school attendees entered the EPPE study through the Adaptive Social Behavior Inventory (ASBI; Hogan, Scott and Bauer, 1992) – a measure that was completed by a pre-school centre worker who knew the child well. Five factors underlay the items of this inventory and these cover the following social skills and behaviors: Co-operation & Conformity; Peer Sociability; Confidence; Antisocial Behavior; and Worried/Upset Behavior.

At mean age 58 months, the items in the ASBI assessment battery were re-examined for their suitability to this now older sample of children. Deciding the ASBI was less appropriate for children aged 58 months, the EPPE team adapted the ASBI into a scale that they termed the Child Social Behavior Questionnaire (CSBQ; see Sammons et al., 2003). In adapting the ASBI to measure behaviors that were beginning to emerge in children as they entered primary school, the CSBQ was administered by the children's primary school teachers and included ten additional items. Two of the subscales of the CSBQ (Self Regulation and Antisocial/Worried Behavior) are here independently assessed as outcome measures reflecting social development and feature alongside an independent analyses of these same young children's GCA.

Risks to development

This study divided potential risks according to the ecological level of their origin. Risks were either closely (proximal) or distantly (distal) related to the children in accordance with *Ecological Systems Theories*. Seven of the measured risks in this study were hypothesized to be (at least) proximal to the *child* whilst fourteen were judged to be more distal and thereby more proximal to the *family*. Each of these two sets of risks (7 child-level, 14 family-level) were then hypothesised to have impacts on development that were best measured with all individual risks being considered in combination with one another.

Although the traditional means of measuring the impact of risks acting in combination upon development can be considered to be cumulative indices of dichotomized and summated risks (e.g. Sameroff, Seifer, Barocas, Zax and Greenspan, 1987) this method has faced criticism (e.g. Burchinal, Roberts, Hooper, & Zeisel, 2000). As such, this empirical investigation ran Confirmatory Factor Analyses (CFA) using formative measurement (see Hall et al., 2010; Kleine, 2006) to obtain separate measures of child- and family-level risks acting in combination. This CFA procedure returned combined measures that were based upon individual risks being allowed to vary in their individual contributions and did not necessitate the dichotomization of continuously measured risks such as birthweight (see Table 2 in the Results).

Quality of, and duration in, programs of pre-school

The *global/overall quality* of the pre-schools that the children attended was measured through trained fieldworker assessment via the Early Childhood Environmental Rating Scale-Revised Edition (ECERS-R; Harms, Clifford and Cryer, 1998). This measure assessed seven distinct aspects of provision and an *overall/global measure* of quality was obtained from these by taking the mean of the items.

Five measures of the quality of the *processes* that took place within pre-schools were also assessed via fieldworker assessment and involved two observational instruments: 1) The Early Childhood Environmental Rating Scale-Extension (ECERS-E; Sylva, Siraj-Blatchford and Taggart, 2006), and 2) The Caregiver Interaction Scale (CIS; Arnett, 1989). Like the ECERS-R, the ECERS-E provided a mean score based on a number of subscales which assessed the curricular provision in early literacy, mathematics, science, and diversity. By contrast, the CIS assessed the interactions of caregiving staff with the young children and returned four subscales reflecting the quality of these relationships - qualities which were analyzed individually in this study. These relationship

subscales refer to: *Positive Relationships; Punitive Relationships; Permissive Relationships; and Detached Relationships.*

In addition to the overall/global quality and the quality of the processes taking place within the pre-schools, seven measures of the quality of the structures within pre-schools were also assessed (via observation). These seven structural measures were: The *manager's* highest academic (1) and childcare (2) qualifications; the mean *caregiving-staff* age (3), highest academic (4) and childcare (5) qualifications; the number of care-giving staff (6); and the number of children enrolled at the pre-school (7). Finally, the duration that young children attended their pre-school was recorded as the number of months that each child had spent in the pre-school whose quality was assessed.

Analytic Approach

The secondary analyses of this investigation were shaped by considerations that originated from the data and design of the EPPE study and by the findings of past research. For example, previous investigations into developmental risks and resilience prompted combined measures of developmental risk to be differentiated according to their ecological levels (e.g. Kuperminc, Wilkins, and Alvarez-Jimenez, 2009). Partially in response, this investigation then identified statistically-significant instances of protected development via statistically-significant multiplicative-interaction terms of the form: *Combined Risk x Protective Factor.*

Further important determinants of these analyses included: a need to control for the effects of nesting children within pre-schools; missing data imputation; and the analyses explicitly adopting a developmental perspective. This developmental perspective was achieved through value-added analyses that estimated protection against risk whilst controlling for earlier levels of development. In designing analyses that took all these factors into consideration, a series of aggregated Structural Equation Models (SEM) were developed that adjusted standard errors to take into account the multi-level structure of the data and reliably (Graham, 2001) estimated missing data using the Full Information Maximum Likelihood algorithm (see Hall, 2009).

Figure 1 presents a stylized representation of the SEM that were specified to examine the relationships between latent combined risks, the development of children's cognitive and social abilities, and the quality and duration of children's attendance at pre-school. A series of analyses were conducted in which each measure of quality was independently examined to determine whether it could significantly moderate the effects of each of the combined risks as they impacted each measure of development that was assessed at entry to school

(GCA, self regulation, antisocial/worried behavior). Furthermore, duration of attendance at pre-school was also tested alongside each measure of quality, both as an additional moderator of risk but also as a moderator of the effects of quality. As a result, when testing the hypotheses of risk-moderation, three multiplicative statistical interaction terms were used: 1. [quality x risk], 2. [duration x risk], and 3. [quality x duration x risk].

Insert Figure.1

RESULTS:

Model fit

Although SEM typically estimates how closely specified statistical models fit the data to which they are applied, this was not possible in all the analyses here reported. When *latent* interaction terms were specified (i.e. *latent* risk x *observed* quality) it was not possible to calculate *absolute* fit indices. As a result, there was a lack of comprehensive evidence for determining the success of a model at replicating the patterns of data used with it. However, Kenny (2008) criticizes fit indices as sole indicators of the validity of SEM and this suggests that their omission from these analyses need not prohibit an interpretation of the results that were obtained.

Table 1 presents the fit indices of the SEM that were specified to test the *initial* impacts of combined risks upon development (prior to testing for protective effects) and to reveal their compositional structures. Table 1 reveals that the same statistical model (illustrated in Figure 1) was able to accurately replicate the data that were used within it despite the two different domains of development.

Insert Table.1

Examining the fit indices of Table 1, the Comparative Fit Index (CFI) was consistently identified as being close to its upper limit of 1 (0.99, 0.98), as was the Tucker-Lewis Index (TLI; 0.98, 0.97). Both of these results suggest a high degree of model fit between the hypothesized models and the patterns in the data within them. At the same time, the Root Mean Square Error of Approximation (RMSEA) was found to lie within a range that has also been associated with a high degree of model fit (0.017 to 0.031).

Estimating combined risks

Table 2 reveals the individual formative factor loadings of each of the variables that were theorized as a potential risk to young children's development. Whilst some individual risk factors were identified as significant across the cognitive and social domains and for all three measures of development at entry to school (e.g. birthweight), others were instead limited to just one of these domains (e.g. number of siblings), or for just one developmental outcome (e.g. whether or not a mother was working).

In addition to the differential contributions of individual risks across each developmental domains and each developmental outcome, Table 2 also reveals sizeable differences between the individual contributions of each risk to their respective combined measure. For example, Home Learning Environments (see Melhuish, Sylva, Sammons, Siraj-Blatchford, Taggart, & Phan, 2008) made sizeable contributions (relatively large standardized beta regression coefficients) to the overall level of developmental risk that was specific to the family. By comparison, variables indicative of socioeconomic status (parental salary, education, occupational level) made contributions that were consistently smaller in their magnitudes. This particular differentiation in the size of risk-contributions suggests that (for child development) it was what parents did, rather than who parents were, that was of greatest importance (see also: Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Elliot 2002, 2003; Melhuish, Sylva, Sammons, Siraj-Blatchford, Taggart, Phan, & Malin, 2008).

Insert Table.2

Measuring the impacts of combined risks on cognitive and social development

Table 3 displays the various impacts of the combined-risks that were specific to each of the three measures of development that were assessed at entry to school (at mean age 58 months). Of note are the much larger risk-impacts at 36 months rather than 58. This disparity is partially due 58 month risk-impacts being estimated alongside the impacts of: a) developmental measures assessed at 38 months, and b) the combined risk to developmental abilities at 38 months.

While family-level risk demonstrated generally greater impacts upon measures of development at 38 and 58 months than did child-level risk (Table 3), the size of these impacts was not consistent. Specifically, the child and family-levels of risk were less associated with the antisocial/worried behavior of young children at 58 months than they were with self regulation or GCA. This suggests that while risks maintain an independent effect on development at entry to school that is over-and-above the effect of earlier levels of development (when considering cognitive skills and self regulation); this is not the case for antisocial/worried behavior. The implication of this finding,

that antisocial/worried behavior may be more driven by earlier levels of development rather than the direct effects of risks, is however a question that requires further investigation.

Insert Table.3

The role of programs of early education in protecting cognitive and social development

Each of the 13 measured qualities of pre-school had its direct and risk-moderating effects estimated upon each measure of development that was assessed at entry to school (at 58 months) and for each (ecological) level of combined risk. Five separate sets of SEM were constructed to test the five combinations of these risk and quality effects:

(1) An initial model including only direct effects of one combined-risk and one aspect of quality on the one developmental outcome of interest

(2) Direct effects plus the *risk x quality* interaction

(3) Direct effects plus the *risk x duration* interaction

(4) Direct effects plus the *quality x duration* interaction

(5) Direct effects plus the 3-way interaction between *risk, quality, and duration*.

Although it is acknowledged that the division of these analyses was not ideal or optimal, this solution was obliged by the complexities inherent to the methods that were used to measure combined risks and the possibility of their moderation. Any potential deterioration in the validity of the results through this division of analyses is also partially mitigated by: 1) improvements made to measuring combined risks (see Hall et al., 2010); 2) the variety of qualities that were examined; and 3) the statistical sensitivity of the analytical procedures that are here reported.

Table 4 presents a summary of the significant instances of protection that were evidenced as due to the quality of the *processes* taking place within pre-school. Higher quality processes offered more frequent instances of partial protection when the risk to development was specific to the child rather than to their family. Furthermore, the quality of processes was found to offer partial protection to GCA at entry to school that systematically differed from the partial protected offered to social skills. Whilst the quality of pre-school processes were able to partially protect GCA even when children's duration of attendance was short, this was not so for self regulation or antisocial/worried behavior.

Insert Table.4

Table 5 summarizes the significant instances of protected development that this investigation found as stemming from the quality of the *structures* within pre-schools. Despite instances of significant partial protection being found for each of the measures of development that were assessed at entry to school, there was also substantial variation between how frequently these occurred. For example, the qualities of the structures within pre-schools offered more frequent instances of partial protection to GCA rather than to self regulation or antisocial/worried behavior. These findings indicate that GCA was more likely to be protected (against the effects of risks) than were social skills and this suggests that the quality of structures (such as staff qualifications) might not contribute towards the correction of some dysfunctional social skills in young children as strongly as they do towards dysfunctional cognitive abilities.

Insert Table.5

Comparing the instances of protection that were found for the qualities of processes (Table 4) and structures (Table 4), noticeable differences can be observed between the types of protection offered. The primary difference common across both tables is that there were many more instances of protected cognitive rather than social development (46% vs. 15%). Furthermore, this higher rate of protection itself varied such that the protection associated with the quality of structures was consistently-coupled with longer durations of pre-school attendance whereas those associated with the quality of processes were not. This suggests two conclusions. First, that the qualities of the processes that take place within pre-schools are better placed to protect children's cognitive and social development from the impacts of child- rather than family-level risks. Second, the protection of social development is more reliant upon children experiencing higher quality pre-school environments for longer durations. This second conclusion also extends prior findings from the main EPPE project which found that the combination of high-quality with high-duration showed the strongest positive effects on children's cognitive development at entry to school (Sammons et al 2002)

Overall, these findings suggest that the quality of pre-schools was better placed to: 1) protect cognitive rather than social development; 2) protect development against the effects of child- rather than family-level combined risks; 3) protect development through higher quality processes rather than structures. Nonetheless, it is also relevant to note that there is a link between structures and quality, with higher levels of staff qualification (especially of center managers) predicting higher observed quality (Sylva et al., 2004).

DISCUSSION:

The main aim of this paper was to demonstrate if and how programs of universal pre-school could mitigate the impact of developmental risks and so thereby offer protection to young children's cognitive and social development. The results of the SEM analyses revealed that there were many more instances of significantly protected cognitive (46%) rather than social/behavioral development (15%). Further, perhaps the most important protective finding was that the global/overall quality of pre-school (incorporating assessments of both structures and processes) has the potential to protect the General Cognitive Abilities of young children from the significant impacts of family-level risks (see Table 4). Given that the combined family-level risk measured in these analyses was also broadly analogous to socioeconomic status (though also encompassing additional aspects of social capital), this suggests that the attendance of young children at higher quality programs of universal pre-school *has the potential* to partially combat the effects of social inequalities in a manner similar to Early Interventions such as the High/Scope Perry Pre-school Project (although not necessarily to the same extent). This therefore makes it possible to conclude that programs of universal pre-school *have the potential* to serve as a type of intervention within normal populations by offering a form of primary prevention (see Sylva, 2000).

However, the protective effects of high-quality pre-school that were evidenced in this study must not be *over*-emphasized – they must be interpreted in light of past research. For example, researchers such as Caughy, Dipietro and Strobino (1994) have reportted that although higher-quality programs of early education and care can benefit the educational attainment of disadvantaged children, even greater levels of attainment can be expected if such children are in Early Interventions due to the fundamental differences between targeted Early Interventions and programs of universal pre-school.

It should also be noted that the partially protective impacts identified in this study are likely to vary across different types of pre-school. Although the partially protective effects would be expected to be greatest in those types which provided on average, the highest quality of care and education, the possible association of risk with type remained a question that was left unasked. Earlier analyses from the main EPPE project indicated that effects associated with types of pre-school were less strong than those related to quality, and that type-effects were non-significant when quality was taken into account (Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Elliot 2002, 2003).

A further limitation of this study which strongly suggests a direction for future research is that cognitive and social development was examined over only a relatively short period of time when considering longer-term developmental pathways (e.g. from birth to adulthood). Further work is needed to establish whether the statistical associations found here are replicable across other samples, other domains of children's development, other time frames, and different types of combined-risk (e.g. biological development and biological risks).

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Table 1. Model fit indices for the Structural Equation Models including only developmental abilities and developmental risks

	With **Child-**level combined risks			With **Family-**level combined risks		
	1	**2**	**3**	**4**	**5**	**6**
Tests of model fit	Cognitive Model	Self Regulation Model	Antisocial Behavior Model	Cognitive Model	Self Regulation Model	Antisocial Behavior Model
1. Chi-Square Test of Model Fit	2274.50	150.74	134.05	47.81	119.66	118.91
degrees of freedom	*25*	*55*	*55*	*13*	*65*	*65*
P-value	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
2. Comparative Fit Index	0.99	0.98	0.98	0.99	0.99	0.99
3. Tucker-Lewis Index	0.98	0.97	0.97	0.97	0.98	0.98
4. Root Mean Square Error of Approximation	0.025	0.025	0.020	0.031	0.017	0.017

Table 2. Potential child- and family-level risks to developmental outcomes at school entry

Child- and Family-level measures	Factor Loadings (*standardized βs*) Cognitive Models	Self Regulation Models	Antisocial / Worried Models
Potential child-level risks			
Male gender	**0.28*** **	**0.73*** **	**0.59*** **
English additional language?	**0.48**[a]	**0.45**[a]	**0.55**[a]
Birth weight	**-0.37*** **	**-0.34*** **	**-0.21***
No. of siblings	**0.25****	0.16	0.25
Birth order	0.12	0.14	0.19
Ethnic Afro-Caribbean?	**0.25*** **	-0.03	-0.02
Minority: Bangladeshi?	**0.12***	0.00	-0.01
Indian?	0.01	-0.04	-0.01
Mixed ethnicity?	**0.14****	0.01	0.02
Other ethnicity?	0.09	0.10	**0.13***
Pakistani?	**0.31****	0.09	0.10
"Any event affected your child's development?"	-0.03	0.00	-0.01
Potential family-level risks			
Family salary	**-0.17****	-0.17	**-0.25***
Mother's occupational status	**-0.19****	-0.19	-0.28
Partner's occupational status	-0.10	0.06	0.06
"Highest status in family?"	-0.01	-0.14	-0.10
Mother's qualifications	**-0.25*** **	**-0.17***	-0.14
Partner's qualifications	0.00	0.06	**0.24***
Mother working?	-0.02	-0.13	**-0.23****
Partner working?	**-0.09***	0.02	0.00
Either parent working?	-0.08	0.01	0.09
Two parent family?	0.02	0.00	0.00
Mother's age	-0.08	**-0.17***	-0.18
Partner's age	0.02	**0.21***	**0.24***
No. of non-parental carers	**-0.14*** **	0.04	0.04
Home Learning Environment	**-0.45**[a]	**-0.69**[a]	**-0.68**[a]

**p < .05; **p < .01; ***p < .001*

[a] Unstandardized factor loadings set to 1 so there is no returned significance

Table 3. Impacts of combined child and family risks to measures of cognitive and social development that were assessed at 36 and 58 months of age

Combined Risk relative to:	Ecological Level	Risk Impact upon Development assessed at (*standardized ϐs*): **36 months**					**58 months**[†]
		Cognitive Development Model					
1) *General Cognitive Ability* (at 36 and 58m)	Child-	-0.38***					-0.06***
	Family-	-0.53***					-0.10***
		Social Development Models					
		Co-operation & Conformity	*Peer Sociability*	*Confidence*	*Antisocial Behavior*	*Worried/ Upset Behavior*	
2) *Self Regulation* (at 58m)	Child-	-0.23***	-0.22***	-0.17***	0.01	0.02	0.09***
	Family-	-0.24***	-0.20***	-0.23***	0.06*	0.02	-0.14***
3) *Antisocial/Worried Behavior* (at 58m)	Child-	-0.23***	-0.24***	-0.18***	0.00	0.01	-0.01
	Family-	-0.24***	-0.22***	-0.24***	0.05	0.02	0.04*

**p < .05; **p < .01; ***p < .001*

[†] *Averaged risk impacts at 58m from models testing only direct effects*

Table 4. Psychological development at age 5: Significant interactions between risks, the quality of pre-school processes, and the duration that children attended pre-school

		Psychological development at age 5 years (*unstandardized Bs*)		
Combined Latent Risk	**Process Quality** of Pre-school	General Cognitive Ability	Self Regulation	Antisocial / Worried Behavior
Child-Level	Positive Relationship	2-Way[a] (0.04*)	3-Way[b] (0.04**)	3-Way[b] (-0.06***)
	Punitiveness		3-Way[b] (-0.04***)	
	Permissiveness			
	Detachment	2-Way[a] (-0.03*)	3-Way[b] (-0.04**)	3-Way[b] (0.06**)
	Global Quality			
	Educational Quality	2-Way[a] (0.02*)		3-Way[b] (-0.05*)
	Duration			2-Way[c] (0.04*)
Family-Level	Positive Relationship			
	Punitiveness			
	Permissiveness			
	Detachment			
	Global Quality	2-Way[a] (0.03***)		
	Educational Quality	2-Way[a] (0.02**)		
	Duration			

[a] 2-Way interaction: risk *x* quality;

[b] 3-Way interaction: (risk *x* quality) *x* duration of pre-school attendance;

[c] 2-Way interaction: risk *x* duration of pre-school attendance;

**p < .05; **p < .01; ***p < .001*

Table 5. Psychological development at age 5: Significant interactions between risks, the quality of pre-school structures, and the duration that children attended pre-school

Combined Latent Risk	**Structural Quality** of Pre-school	Psychological development at age 5 years (*unstandardized Bs*) General Cognitive Ability	Self Regulation	Antisocial / Worried Behavior
Child-Level	*Manager:*			
	Highest Academic Qualification	3-Way[b] (0.03*)		
	Highest Childcare Qualification	*3-Way[b] (0.03**)*		
	Staff: Mean Age	2-Way[a] (0.02**) *and* 3-Way[b] (-0.03*)		
	Mean Highest Academic Qualification			
	Mean Highest Childcare Qualification	3-Way[b] (-0.03*)		
	Number of Staff			
	Number of Children			3-Way[b] (-0.11*)
	Duration			2-Way[c] (0.04*)
Family-Level	*Manager:*			
	Highest Academic Qualification			
	Highest Childcare Qualification			
	Staff: Mean Age		3-Way[b] (-0.05*)	
	Mean Highest Academic Qualification			
	Mean Highest Childcare Qualification	3-Way[b] (-0.02*)		
	Number of Staff	3-Way[b] (-0.01*)		
	Number of Children	2-Way[a] (0.38**)		
	Duration			

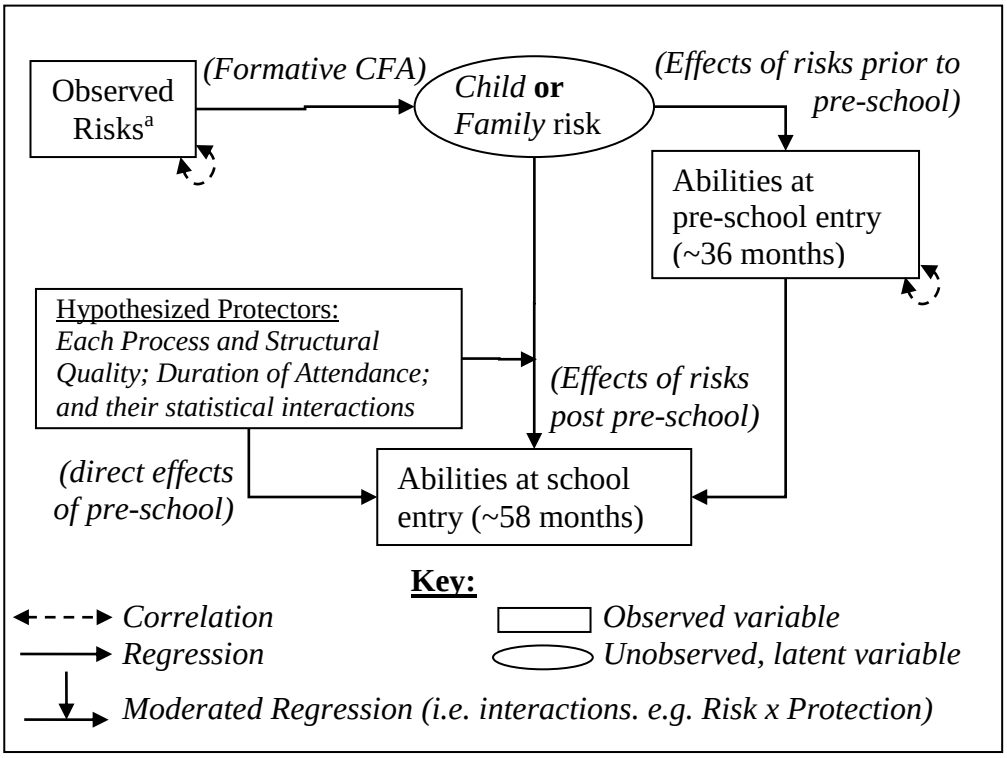
[a] 2-Way interaction: risk *x* quality;

[b] 3-Way interaction: (risk *x* quality) *x* duration of pre-school attendance;

[c] 2-Way interaction: risk *x* duration of pre-school attendance;

**p < .05; **p < .01; ***p < .001*

Figure 1. *Stylized* path diagram illustrating the Structural Equation Models used to establish whether pre-school could protect developmental abilities at entry to school



([a] Observed Risks = 21 in total: 14 'Family', 7 'Child')