EQUAL HOURS?

The impact of hours spent in early years provision on children's outcomes at age five, by socio-economic background

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THE SUTTON TRUST

About the Sutton Trust

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Key Findings

- Several decades of research has found that early education and care can have a positive effect on children's cognitive, behavioural and social outcomes, particularly if it is of high quality, and particularly for disadvantaged children. However, less is known about the optimum number of hours of early years provision, including whether this differs by socio-economic background.

- The Study of Early Education and Development (SEED) is a longitudinal study looking at the impact of early years provision, the home environment and parenting on cognitive and socio-emotional development. This report contains new analysis of the SEED dataset, to look in greater detail at the impact of the number of hours that young children have in early years education and care, with breakdowns by socio-economic background. The report also looks at how the quality of a child's home learning environment can impact on the effects of time spent in early years provision.

- Here, we find the relationship between children's development between ages 3 and 5 and children's exposure to early childhood care and education is complex and differs substantially between children from disadvantaged families and their more advantaged peers.

Impact of early years provision by socio-economic group

- For children from disadvantaged families (those in the lowest 40% of the income distribution), there are benefits for cognitive development associated with early childhood education and care usage between the ages of 3 and 5 years. These benefits are on average substantially greater if the provision is of high quality.

- For children in more advantaged families (the upper 60% of the income distribution) early childhood care and education is less important than for disadvantaged children. For better off children, outcomes from attendance are more mixed, with both positive and negative associations, although there are fewer negative impacts for this group when provision is of high quality.

- There are some socio-emotional benefits but also some socio-emotional drawbacks linked with formal group early childhood education and care usage. The drawbacks largely concern externalising (or antisocial) behaviour. The association with externalising behaviour, behavioural self-regulation and emotional self-regulation is strong for better off children, whereas for internalising behaviour (children becoming easily upset or anxious) the association is stronger for disadvantaged children.

- However, these drawbacks are not found for disadvantaged children in high quality provision. It is also reduced, even at high levels of attendance, when a child is in a mix of individual and group provision.

- Disadvantaged children benefit more from early childhood care and education when attending with children from a mix of socio-economic backgrounds, likely due to a peer influence operating for both children and parents.

Time in early childhood education and care

- Most of the negative impacts seen for externalising behaviour of more time in an early years setting are already seen by the time a child is in provision for 15 hours a week. Increasing hours beyond 15-20 per week does not appear to further increase externalising behaviour, except for non-disadvantaged children, and only if in provision for 35 hours or more per week.

- For disadvantaged children, there are no significant differences in socio-emotional outcomes between those in formal early years provision for 15 to 20 hours per week and children who attended for a higher number of hours.

- There will be little extra benefit to children's development of early years provision of greater duration than 15-20 hours per week, but if the provision is of high quality, there are unlikely to be adverse effects for disadvantaged children, and longer hours could bring wider benefits to families (e.g. by allowing parents to work).

Importance of the home learning environment

- A high quality home learning environment is beneficial for children, with higher family home learning environment (HLE) scores associated with better verbal ability at age 5 for both disadvantaged and better-off children.

- For disadvantaged children, a better home learning environment is associated with better behavioural self-regulation at age 5 and can also help to prevent the poorer socio-emotional outcomes which are otherwise associated with high use of lower quality early years provision.

Introduction

Background

The Study of Early Education and Development (SEED) is a longitudinal study looking at the impact of early education and care, the home environment and parenting on cognitive and socio-emotional development. This report contains new analysis of this data set, giving more detailed information on the impact that the number of hours of early years education and care has on young children, with breakdowns by socio-economic background.

Interest in early childhood education and care (ECEC) has increased internationally. Partly this reflects interest in facilitating the social and educational development of children, both for deprived children and the general population, and partly interest in increasing parental, particularly maternal, employment. Concern for such issues has led to substantial policy change in the UK in recent decades.

For the general population, prior to 1998 there was no statutory obligation for the state to provide any early childhood services for children under the statutory school age of 5 years. However, there were provisions for 'at risk' children, as well as some nursery education for 3- and 4-year-olds, typically in more disadvantaged areas, but availability was haphazard around the country. Since then, in the 21st century in the UK, research evidence and social and political factors have contributed to radical changes in ECEC provision. The policy changes that have occurred have included free entitlement to ECEC.

Currently in the UK, parents of children are entitled to 15 hours/week of free ECEC from the child's third birthday to the start of school. This was introduced in 2004, following the findings of the Effective Pre-school, Primary and Secondary Education study (EPPSE; Sylva, Melhuish, Sammons, Siraj-Blatchford & Taggart, 2004) showing that those children who had received ECEC prior to school were more likely to have better developmental, cognitive and socio-emotional outcomes at the start of school, as well as experiencing a long-term positive impact on their attainment outcomes, with a larger positive impact for disadvantaged children. Somewhat uniquely, the EPPSE study was able to compare children who experienced formal early education and care with those who had not had any, due to patterns of usage in the UK at the time.

From 2017, the free entitlement to ECEC was extended. Eligibility is defined as those in 'working' families, broadly if one of the parents is employed for 16 hours/week or more, then the entitlement increased to 30 hours/week of free ECEC. Previous research by the Sutton Trust has found that only 20% of families in the bottom third of the earnings distribution are currently eligible for the 30 hour entitlement (Pascal et al, 2021). The question arises whether, for parents who do not work 16 hours/week or more, does the current policy disadvantage their children? As many disadvantaged parents do not work for 16 hours/week or more, this might be contrary to the policy of 'closing the gap' for the developmental outcomes for children of disadvantaged parents as compared to the rest of the population. Should the 30 hours entitlement be extended to all children, particularly those of low-income families, in order to ensure that children from all income backgrounds are, as far as possible, on an even footing when starting at school?

For most aspects of development, the evidence indicates that ECEC is associated with beneficial effects for children. For a comprehensive review of the evidence relating ECEC experience to child development, see Melhuish, 2015. However, several studies have reported that increased ECEC hours may be associated with a specific non-beneficial change in development, in particular, an increase in anti-social (or externalising) behaviour. Indeed, one possible concern is a potential increase in anti-social behaviour if extending the 30 hours entitlement to ECEC. Thus, the potential link between hours of ECEC and anti-social behaviour has become of particular policy interest.

The Study of Early Education & Development (SEED)

Politicians and government officials recognised that the EPPSE evidence had been extremely useful for the formation of early years policy, and policy had changed greatly in the years of the EPPSE study. However, the EPPSE sample had been assembled in 1997, at a time when a very different set of conditions existed, and hence the data were becoming less relevant to the current situation, mainly as a result of the policy changes following EPPSE evidence. Therefore, the government decided to set up a new longitudinal study to consider the impact of current early years provision, so that it could inform future policy. A competitive tender was issued for the Study of Early Education and Development (SEED), which started in 2013.

SEED is a longitudinal study of over 5000 children, which has collected data on the family circumstances, ECEC experiences, and development of the children up to age 7 years. It provides a data set that can be used to explore the relationships between ECEC experience and child outcomes adjusting for demographic and parenting factors. In relation to the policy question of hours of entitlement to ECEC from age 3 to the start of school, it would be useful to explore how hours of ECEC relate to children's outcomes at the start of school (age 5 years). In particular, it would be useful to know how the relationship between hours of ECEC and child outcomes varies for different disadvantage groups. Thus, it is proposed to explore the relationship between hours of ECEC and children's cognitive and socio-emotional outcomes for three distinct income groups; the 20% most disadvantaged, the moderately disadvantaged 20-40% income band, and the least disadvantaged upper 60% income band. These income bands were chosen because they are frequently used in government policy decisions. Particular attention is paid to anti-social behaviour (externalising behaviour) because its emotional connotations lead to it having substantial policy relevance.

By the time of the SEED study, almost all children attended some sort of formal setting before starting school. While a positive development, it does alter the parameters of what can be examined using data from the study, making the baseline low use of early years provision, rather than no use at all. At the same time, the quality of ECEC has also improved (Melhuish 2016; Melhuish & Gardiner, 2019), through the reduction in poor quality ECEC which was more common twenty years ago, again limiting the comparisons possible with this study compared to EPPSE. It should also be noted that SEED commenced before the 30 hours policy was in place, and as such was not designed to study this policy specifically. However, the study is still able to provide relevant data to explore questions around the policy.

Aims

This report explores the relationship between the type and amount of Early Childhood Education and Care (ECEC) which children receive between age 3 and the start of school and children's cognitive and socio-emotional outcomes at age 5. Consideration is also given to the effects of the quality of group ECEC that children receive between ages 2 and 4, and to the family Home Learning Environment (HLE) that children

experience from ages 2 to 4. In particular, this study focuses on the extent to which the effects of the amount, type and quality of ECEC, and the Home Learning Environment, differ between disadvantaged and less disadvantaged children.

Methodology

Overview of the SEED study

The Study of Early Education and Development (SEED) is a study commissioned by the Department for Education to explore how early education can give children the best start in life and to investigate factors that are important for the delivery of high-quality Early Childhood Education and Care (ECEC) provision.

The SEED study consists of:

1. A longitudinal survey that initially comprised 5,642 families with preschool children from the age of two years to the end of Key Stage 1 (age seven years).
2. Around 1,000 visits to early years group settings and to around 100 childminders to study the quality, characteristics and process of provision.
3. Case studies of good practice in early years settings.
4. A value for money study involving cost data from 166 early years settings.

The longitudinal study collected information from families at four time points:

- Wave 1 (baseline) when the target child was about two years old.
- Wave 2 when the child was about three years old.
- Wave 3 when the child was about four years old.
- Wave 4 when the child was about five years old.

Details of the SEED study are in Melhuish & Gardiner (2020) and all SEED research reports are available at https://www.gov.uk/government/collections/study-of-early-education-and-development-seed.

Measures

Child disadvantage

The SEED sample was selected to include three groups varying in level of disadvantage. Percentages refer to approximate percentage of the population:

1. Most disadvantaged 20% who had a parent in receipt of one of:
   - Income-based Jobseeker's Allowance (JSA-IB);
   - Income-related Employment Support Allowance (ESA-IR);
   - Income Support (IS);
   - Guaranteed element of the State Pension Credit (PC with Guarantee Credit);
   - Child Tax Credit only (not in receipt of an accompanying Working Tax Credit award) with household gross earnings of less than £16,190.
2. Moderately disadvantaged 20%-40% who had a parent in receipt of Working Tax Credit with household gross earnings of less than £16,190.
3. Least disadvantaged 60% who had parents not in receipt of any of the qualifying benefits or tax credits.

For the purposes of this report, a two-way classification of disadvantage was used:

- 40% most disadvantaged children (including the 20% most disadvantaged), ("disadvantaged group").
- 60% least disadvantaged children ("least disadvantaged group").

Cognitive outcomes

Children's cognitive development was assessed directly in the first term of year one using two British Ability Scales (BAS) measures:

1. BAS verbal ability ("naming vocabulary"), a measure of language development.
2. BAS non-verbal ability ("picture similarities").

Age adjusted BAS scores have been used in this report.

Socio-emotional outcomes

Children's socio-emotional development at age 5 was assessed using the Children's Social Behaviour Questionnaire (CSBQ) (Howard and Melhuish, 2017).

As part of the Wave 4 survey interview, parents were asked to provide details of the school attended by their child and the teacher currently teaching them. Subject to parental consent, teachers were invited to complete a CSBQ questionnaire. The assessment was completed in the Spring of children's primary school year one.

This CSBQ questionnaire produced the following child socio-emotional measures:

1. Sociability (e.g., child has friends, child plays with other children).
2. Externalising behaviour (e.g., child loses temper, argues with other children).
3. Internalising behaviour (e.g., child is easily upset, child is anxious).
4. Prosocial behaviour (e.g., child is co-operative, helpful, shares things).
5. Behavioural self-regulation (e.g., child follows instructions, waits their turn).
6. Cognitive self-regulation (e.g. child choses their own tasks, persists with tasks).
7. Emotional self-regulation (e.g., child is calm, child keeps temper).

Age 3 Externalising behaviour

At age 3, children's ECEC providers were asked to complete the Strengths and Difficulties Questionnaire (SDQ) (Goodman 1997). A number of socio-emotional measures were derived from the SDQ, including:

- Child Conduct Problems (e.g., loses temper, is aggressive, takes other children's things).

This is a measure is used in analyses of change in Externalising behaviour from ages 3 to 5.

Early Childhood Education and Care (ECEC)

A three-way classification of ECEC is used for this report:

1. **Formal group ECEC**
   ECEC in a non-domestic setting and eligible for government funding (e.g., day nurseries, nursery classes, nursery schools and playgroups).
2. **Formal individual ECEC**
   ECEC in a domestic setting and eligible for government funding (i.e., childminders).
3. **Informal individual ECEC**
   ECEC in a domestic setting and not eligible for government funding (e.g., childcare with relatives, friends, neighbours or nannies).

The mean weekly usage of each type of ECEC was calculated between age 3 and the start of school, and refers to mean numbers of hours per week on the basis of the 38 week school year.

Quality of ECEC

The quality of 1000 ECEC settings was assessed through half day observations by trained observers. These observations took place in 402 settings that children had attended at age two (Wave 1), and 598 settings that children had attended at age three (Wave 2).

At Wave 2, settings were assessed using the Shared Thinking and Emotional Well-being scale (SSTEW), the Early Childhood Environment Rating Scale – Revised (ECERS-R) and the Extension to the Early Childhood Environment Rating Scale (ECERS-E).

- The SSTEW scale focuses on the quality of interactions between staff and children (Siraj, Kingston & Melhuish, 2015).
- The ECERS-R scale is an overall measure of ECEC quality for the over-threes (Harms, Cryer & Clifford, 2005).
- The ECERS-E focuses on the educational aspects of ECEC experience for the over-threes (Sylva, Siraj-Blatchford & Taggart, 2011).

Demographic measures

These measures were assessed at the Wave 1, Wave 2 and Wave 3 interviews carried out with parents when the children were aged two, three and four, respectively.

1. Childs sex.
2. Child's age in school year.
3. Childs ethnic group.
4. Childs birth weight.
5. Maternal age at birth of child.
6. Disadvantage group (disadvantaged / least disadvantaged).
7. Mother's highest qualification.
8. Highest parental socio-economic status.

9. Number of siblings living in the household.
10. Couple or lone parent household.
11. Workless or working household.
12. Type of accommodation tenure (owner-occupier / renting / other).
13. Household income.
14. Area Deprivation (Index of Multiple Deprivation).

Where demographic measures varied over time, the Wave 2 values were used.

Home environment measures

Nine home environment measures were included in the analyses:

1. Home Learning Environment (HLE) (Melhuish *et. al.* 2008a).
2. Household Chaos.[1]
3. Parent's Psychological Distress.[2]
4. Limit Setting.[3]
5. MORS Warmth.[4]
6. MORS Invasiveness.[4]
7. Authoritative parenting.[5]
8. Authoritarian parenting.[5]
9. Permissive parenting.[5]

HLE is a measure of how often children engage in home activities that allow learning opportunities for the child; e.g., child read to, taken to library, painting/drawing, play with letters/numbers, songs/rhymes. This measure was assessed when children were aged 2, 3 and 4. The mean of these three HLE scores was used in the analysis.

Statistical analysis

Linear regression models

Analyses used linear regression models. All models were fitted to complete cases data: that is, only children with complete data on all model variables were included in the models. The number of cases included for each model are outlined throughout the analysis section.

Standardization of model coefficients

Model coefficients were standardized. For continuous covariates, standardized model coefficients (Beta) give the change in the outcome variable in units of the standard deviation corresponding to a two standard deviation change in the covariate. For categorical (factor) covariates, standardized model coefficients

[1] Mean score from when children were aged 2 and 3. See Melhuish et. al. 2008b.
[2] Mean score from when children were aged 2 and 3. See Kessler et. al. 2002.
[3] Mean score from when children were aged 2 and 3.
[4] Scores from when children were aged 3. See Simkiss *et. al.* 2013.
[5] Scores from when children were aged 4. See Robinson *et. al.* 1995.

(Beta) give the change in the outcome variable in units of the standard deviation corresponding to the difference between a given factor level and the reference level.

Software used

All analyses were carried out in R 4.1.0.

The amount of early years provision used

Summary

- For disadvantaged children, there was an association between higher use of informal individual ECEC (that is, informal childcare with friends and family) between age 3 and the start of school and better outcomes for BAS verbal ability at age 5.

- Regardless of level of disadvantage, there were associations between higher use of Formal group ECEC (that is, formal childcare in playgroups and pre-schools) and poorer outcomes on some socio-emotional measures at age 5.

- For disadvantaged children, there were no significant differences in socio-emotional outcomes for children using 15 to 20 hours per week of formal group ECEC and children in higher Formal group ECEC usage bands.

- For disadvantaged children, using less than 10 hours per week of Formal group ECEC was associated with better socio-emotional outcomes in terms of lower Externalising behaviour and higher Behavioural and Emotional self-regulation.

Introduction

The models discussed in this chapter explore the relationship between the amount and type of ECEC used by children between age 3 and the start of school and children's cognitive and socio-emotional outcomes at age 5. Models explore how these effects differ between the disadvantaged (lower 40% of population) and the least disadvantaged children (upper 60% of population).

Method

Children's cognitive and socio-emotional outcomes at age 5 were analysed in terms of children's ECEC use between age 3 and the start of school, with ECEC use modelled as continuous variables. Initial models analysed ECEC use for all children together. Further models fitted separate effects of ECEC use for the disadvantaged and least disadvantaged children. A final set of models incorporated formal group ECEC use as a factor with a separate effect for the narrow bands (5 hours/week difference between bands) of ECEC use, with separate effects fitted for disadvantaged and least disadvantaged children. In these analyses of narrow bands of ECEC usage, children using more than 15 to 20 hours per week Formal group ECEC were used as the baseline comparison group. This usage band was chosen as the baseline comparison group because it contained the largest number of children. Note the hours per week have been calculated as an average of the hours used in a 38-week school year, and we do not know how these hours are distributed across the week or across the year

All models controlled for demographic and home environment covariates (for more information, see the methodology section). Models were fitted to complete cases data.

Results

Model results are given in Table 1 (all children), in Table 2 (disadvantaged children) and in Table 3 (least disadvantaged children). For the detailed hours per week comparisons, children using more than 15 to 20 hours per week Formal group ECEC were used as the baseline comparison group because it contained the largest number of children.

The numbers of children in the narrow Formal group ECEC usage bands are shown in Table 4 (children with cognitive outcomes) and in Table 5 (children with socio-emotional outcomes). The results of the models of the outcomes at age 5 in terms of narrow bands of Formal group ECEC are shown in Figures 1 to 9. Where the effect for a given usage band was significantly different from the baseline comparison group this is marked with an asterisk. These findings are summarised and discussed in a discussion section below.

Table 1: Results of regression models of outcomes in terms of amount of ECEC use between age 3 and the start of school.

Outcome	ECEC use					
	Formal group		Formal individual		Informal individual	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	+0.017	0.628	+0.018	0.586	+0.067	0.058
BAS non-verbal score	+0.035	0.368	-0.004	0.918	+0.006	0.874
Sociability	-0.052	0.216	-0.055	0.166	+0.004	0.931
Externalising behaviour	+0.163	<0.001***	+0.077	0.051	-0.017	0.683
Internalising behaviour	+0.099	0.023*	+0.034	0.411	-0.036	0.413
Prosocial behaviour	-0.072	0.079	-0.017	0.668	+0.009	0.826
Behavioural self-regulation	-0.114	0.005**	-0.041	0.286	-0.013	0.754
Cognitive self-regulation	-0.028	0.481	-0.021	0.587	-0.012	0.765
Emotional self-regulation	-0.159	<0.001***	-0.060	0.127	-0.006	0.892

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

Table 2: Results of regression models of outcomes in terms of amount of ECEC use between age 3 and the start of school; results for disadvantaged children.

Outcome	ECEC use					
	Formal group		Formal individual		Informal individual	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	+0.033	0.488	+0.013	0.766	+0.109	0.025*
BAS non-verbal score	-0.008	0.878	-0.003	0.943	+0.058	0.267
Sociability	-0.052	0.343	-0.084	0.117	-0.021	0.719
Externalising behaviour	+0.146	0.007**	+0.064	0.227	-0.075	0.200
Internalising behaviour	+0.137	0.017*	+0.040	0.470	-0.072	0.244
Prosocial behaviour	-0.062	0.245	-0.039	0.455	-0.019	0.748
Behavioural self-regulation	-0.101	0.057	-0.050	0.339	-0.028	0.629
Cognitive self-regulation	-0.017	0.754	-0.061	0.241	-0.039	0.496
Emotional self-regulation	-0.150	0.006**	-0.060	0.254	+0.034	0.557

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Table 3: Results of regression models of outcomes in terms of amount of ECEC use between age 3 and the start of school; results for least disadvantaged children.

Outcome	ECEC use					
	Formal group		Formal individual		Informal individual	
	Beta	p-value	Beta	p-	Beta	p-value
BAS verbal score	-0.005	0.925	+0.026	0.602	+0.020	0.689
BAS non-verbal score	+0.083	0.142	+0.003	0.956	-0.043	0.427
Sociability	-0.050	0.423	-0.023	0.695	+0.026	0.654
Externalising behaviour	+0.191	0.002**	+0.089	0.119	+0.042	0.470
Internalising behaviour	+0.054	0.407	+0.023	0.708	-0.008	0.901
Prosocial behaviour	-0.083	0.175	+0.007	0.894	+0.033	0.566
Behavioural self-regulation	-0.129	0.032*	-0.032	0.562	-0.001	0.984
Cognitive self-regulation	-0.042	0.484	+0.023	0.677	+0.009	0.870
Emotional self-regulation	-0.174	0.005**	-0.057	0.312	-0.046	0.423

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Table 4: Number of children in Formal group ECEC usage bands; children with BAS outcomes.

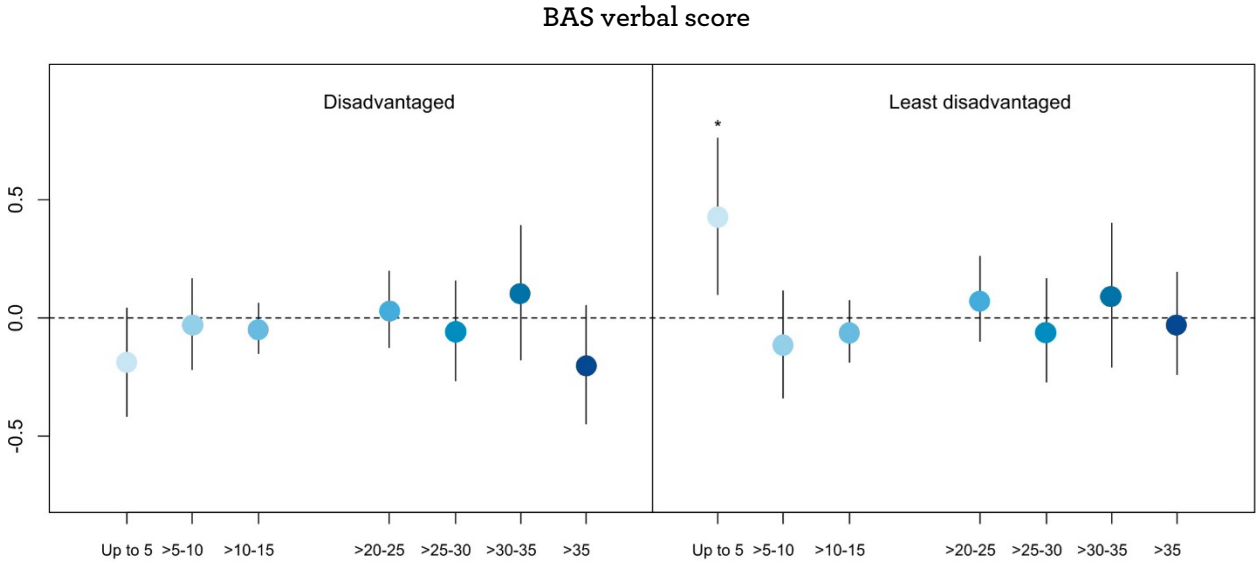
Formal group ECEC usage band	Disadvantaged	Least disadvantaged
Up to 5 hpw	67	32
>5 to 10	100	74
>10 to 15	522	371
>15 to 20	572	379
>20 to 25	152	130
>25 to 30	81	80
>30 to 35	41	37
>35 hpw	57	83

Table 5: Number of children in Formal group ECEC usage bands; children with socio-emotional outcomes.

Formal group ECEC usage band	Disadvantaged	Least disadvantaged
Up to 5 hpw	52	25
>5 to 10	77	62
>10 to 15	414	298
>15 to 20	468	317
>20 to 25	128	108
>25 to 30	67	68
>30 to 35	36	27
>35 hpw	47	67

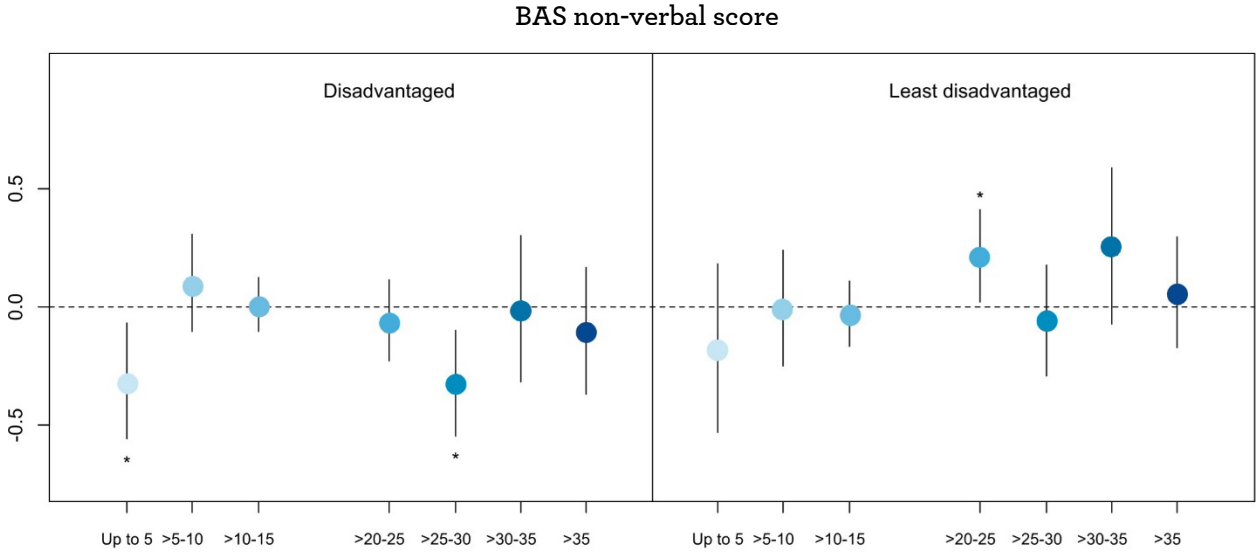
The following diagrams (Figures 1 to 9) show the results of analyses of narrow (5 hours/week) bands of ECEC usage, with the less than over 15 to 20 hours a week group used as the baseline comparison group (0.0 level).

Figure 1: Model of BAS verbal score by banded Formal group ECEC use and disadvantage group.



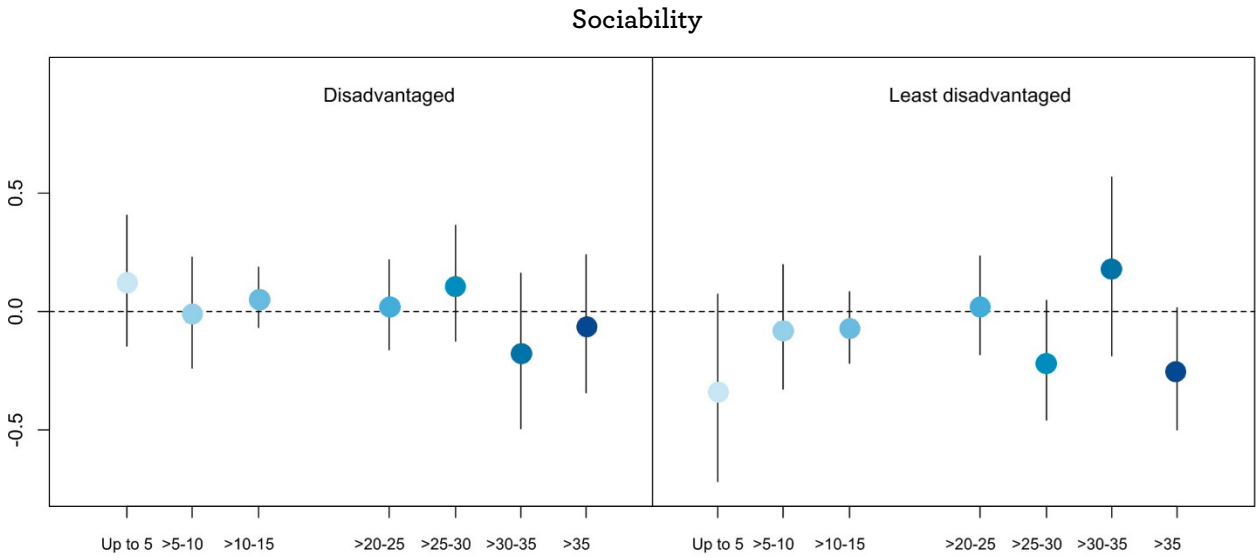
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 2: Model of BAS non-verbal score by banded Formal group ECEC use and disadvantage group.



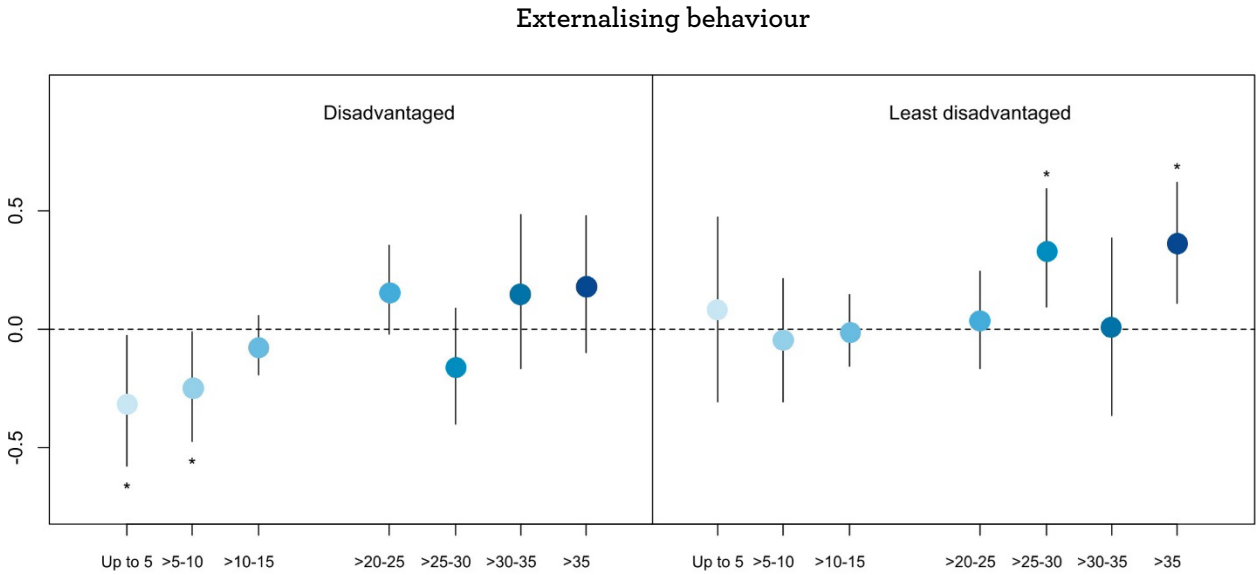
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 3: Model of Sociability by banded Formal group ECEC use and disadvantage group.



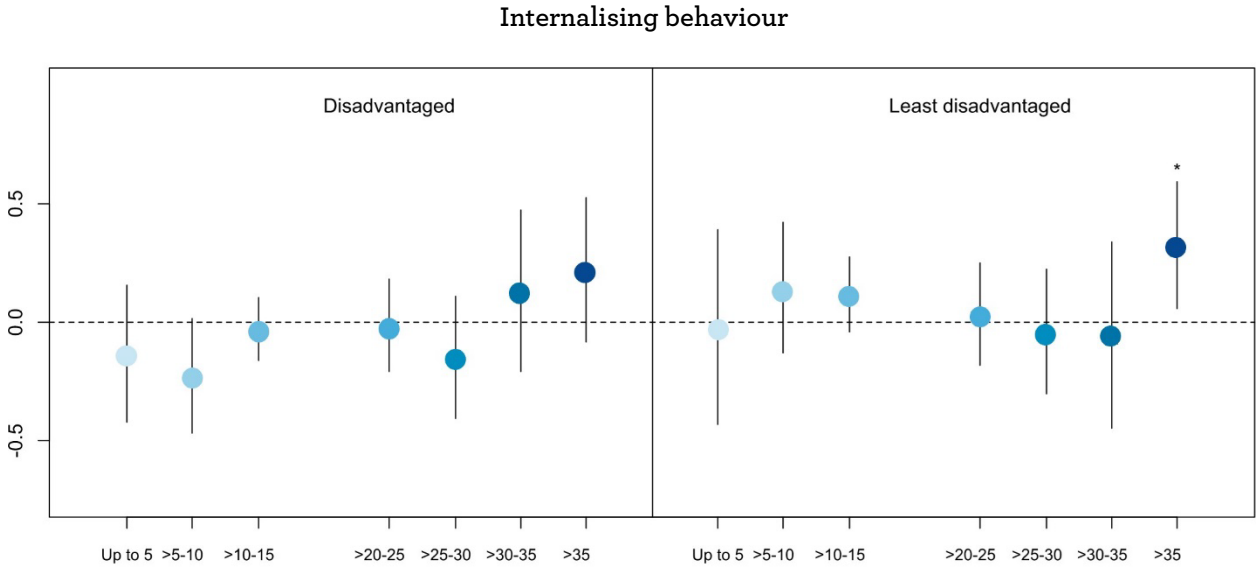
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 4: Model of Externalising behaviour by banded Formal group ECEC use and disadvantage group.



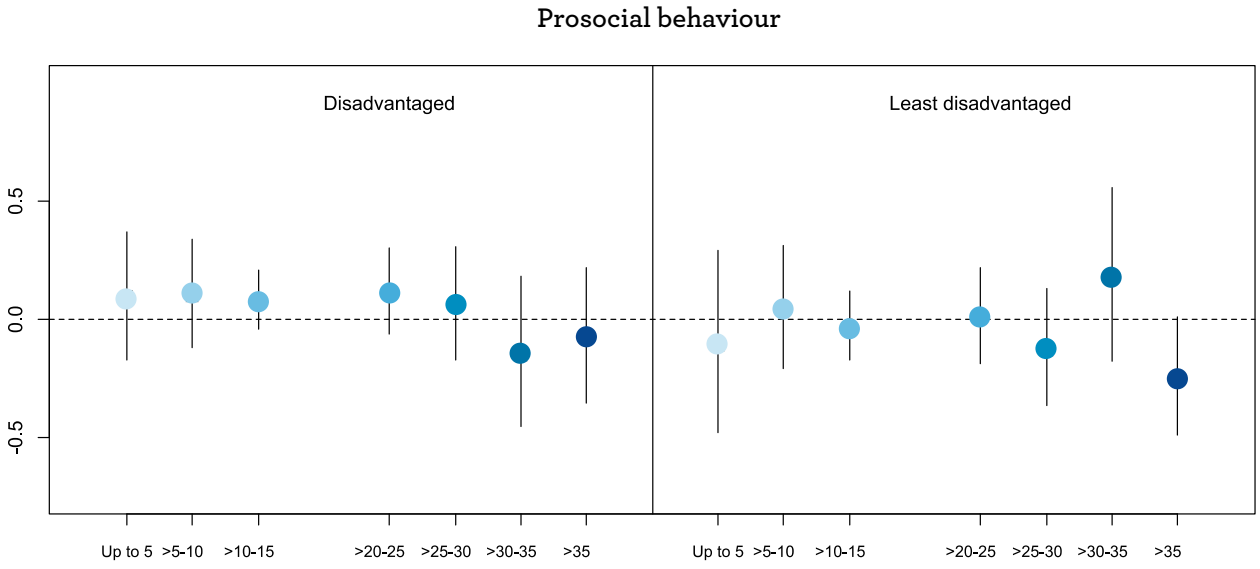
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 5: Model of Internalising behaviour by banded Formal group ECEC use and disadvantage group.



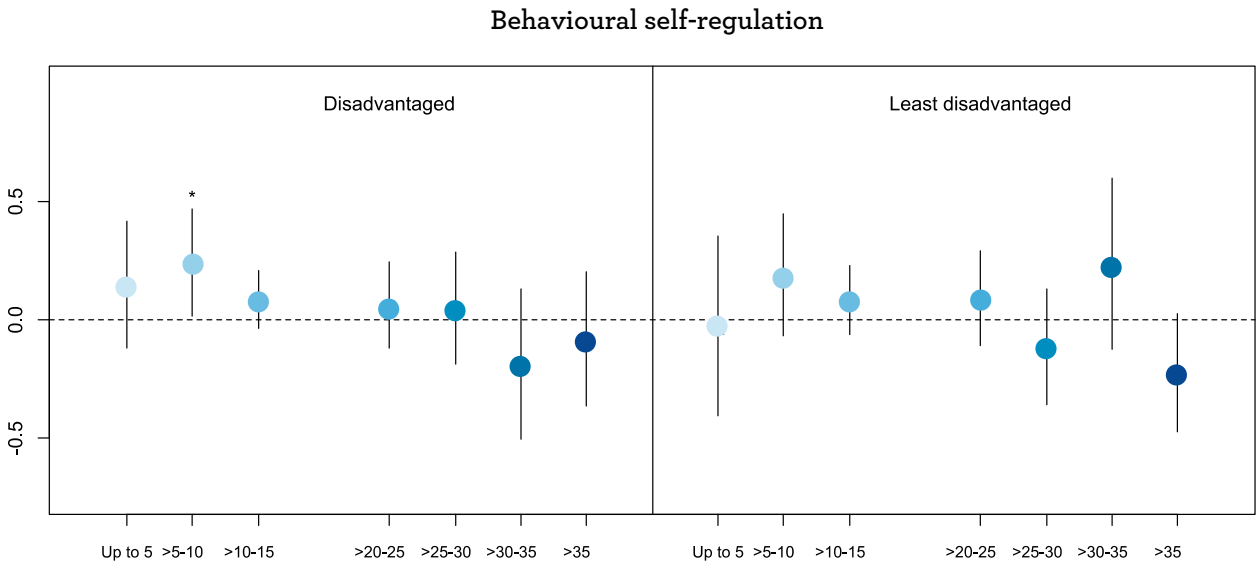
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 6: Model of Prosocial behaviour by banded Formal group ECEC use and disadvantage group.



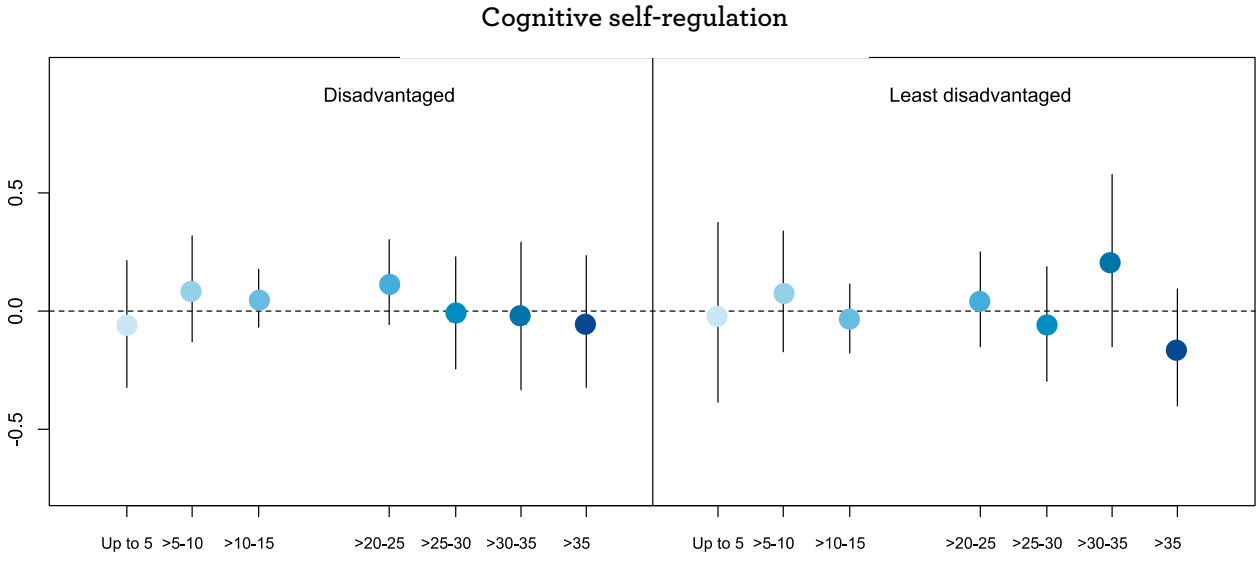
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 7: Model of Behavioural self-regulation by banded Formal group ECEC use and disadvantage group.



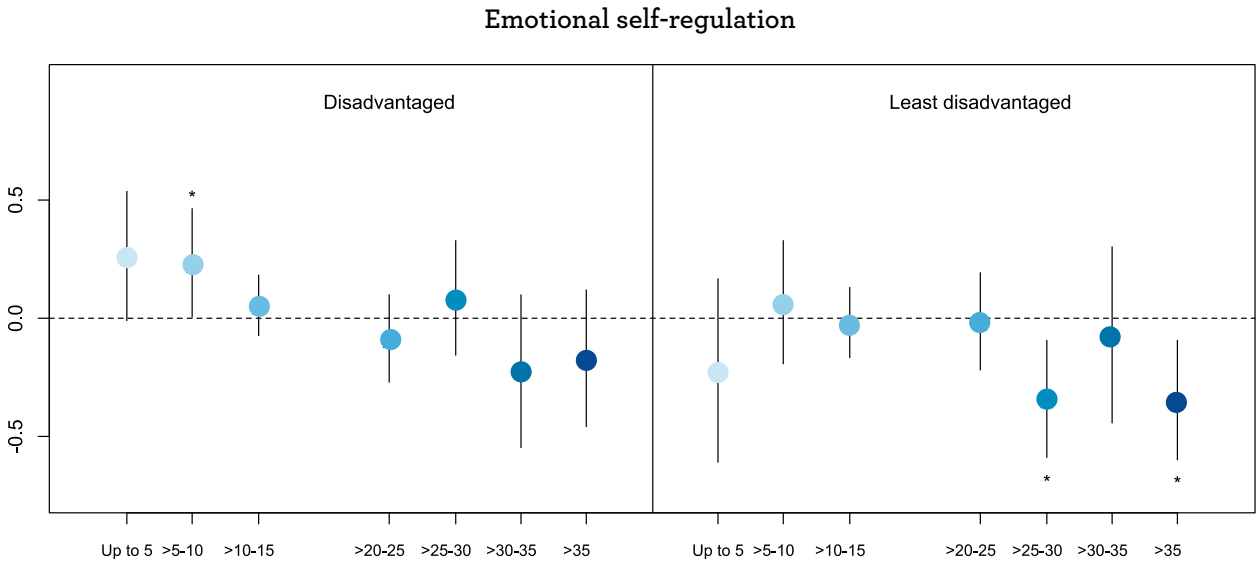
Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 8: Model of Cognitive self-regulation by banded Formal group ECEC use and disadvantage group.



Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Figure 9: Model of Emotional self-regulation by banded Formal group ECEC use and disadvantage group.



Note: the 15-20 hours/week band was chosen as the comparison group as it was the largest group, represented by the 0.0 dotted line.

Discussion

Models with continuous ECEC covariates

The initial models showed associations between higher levels of Formal group ECEC use and poorer outcomes at age 5 for the socio-emotional outcomes Externalising behaviour, Internalising behaviour, Behavioural self-regulation and Emotional self-regulation (see Table 1). There are differences in the effects associated with ECEC usage for the disadvantaged and least disadvantaged children. The deleterious associations between Formal group ECEC use and child socio-emotional outcomes appeared to be stronger for the least disadvantaged children for the outcomes Externalising behaviour, Behavioural self-regulation and Emotional self-regulation (Table 3), whereas for the outcome Internalising behaviour the association was stronger for the disadvantaged children (Table 2).

For the disadvantaged children, there was also an association between higher levels of informal individual ECEC use (this includes care by relatives and friends) and better outcomes for BAS verbal ability at age 5 (Table 2).

Models in terms of narrow bands of Formal group ECEC

For disadvantaged children, hours per week does not show a consistent relationship with non-verbal ability. However, children using up to 5 hours per week Formal group ECEC and those using 25 to 30 hours per week Formal group ECEC have significantly lower BAS non-verbal ability than the 15 to 20 hours per week reference group (Figure 2; left panel).

Disadvantaged children using up to 10 hours per week formal group ECEC have significantly lower Externalising behaviour than children in the 15 to 20 hours per week reference group, and other groups seem equivalent to the reference group (Figure 4; left panel). Disadvantaged children using less than 10 hours per week of formal group ECEC appear to show higher Behavioural and Emotional self-regulation than the 15 to 20 hours per week reference group, and this is statistically significant for 5 to 10 hours per week of Formal group ECEC (Figure 7 and 9; left panel).

The least disadvantaged children using up to 5 hours per week Formal group ECEC have significantly higher BAS verbal ability than the greater than 15 to 20 hours per week reference group (Figure 1; right panel), possibly reflecting their higher level of individual ECEC with greater one-to-one interaction. The least disadvantaged children using more than 20 to 25 hours per week Formal group ECEC have significantly higher BAS non-verbal ability than the more than 15 to 20 hours per week reference group (Figure 2; right panel).

The least disadvantaged children using over 25 to 30 and less than 35 hours per week Formal group ECEC have significantly higher Externalising behaviour, and lower Emotional self-regulation than the more than 15 to 20 hours per week reference group (Figure 4 and 9; right panel). Also, the least disadvantaged children using more than 35 hours per week Formal group ECEC have significantly higher Internalising behaviour than the more than 15 to 20 hours per week reference group (Figure 5; right panel). In contrast,

the >30 to 35 hours per week group shows no difference for Externalising, Emotional self-regulation or Internalising behaviour to the reference group.

Conclusion

For the disadvantaged children only, there was an association between higher use of informal individual childcare with friends and family between age 3 and the start of school and better BAS verbal ability outcomes at age 5. There was no significant relationship for childminders (formal individual ECEC). The fact that this association appeared only for the disadvantaged children may be a "saturation effect": that is, the least disadvantaged children tend to have sufficient language learning opportunities at home and elsewhere anyway, and therefore do not derive additional benefit from time in individual childcare. There was no significant relationship for Formal individual ECEC (childminders) nor for Formal group ECEC.

For both the disadvantaged children and the least disadvantaged children, there were associations between higher use of group ECEC and poorer outcomes on certain socio-emotional measures at age 5.

The models in terms of narrow (5 hours/week) bands of Formal group ECEC usage provide additional information on the shape of the associations between the amount of Formal group ECEC used and children's socio-emotional and cognitive outcomes. It is notable that for the disadvantaged children, there were no significant differences in socio-emotional outcomes between the reference group of children using more than 15 to 20 hours per week Formal group ECEC and the higher Formal group ECEC usage bands., indicating no increase in these effects from higher usage than 15 hours per week of Formal group ECEC.

The quality of ECEC used

Summary

- Attending higher quality Formal group ECEC between ages 2 and 4 was associated with better outcomes for BAS non-verbal ability at age 5. These associations were found for both the disadvantaged and the least disadvantaged children.
- For the disadvantaged children only, attending higher quality Formal group ECEC between ages 2 and 4 was associated with better outcomes at age 5 for the socio-emotional outcomes Sociability, Prosocial behaviour, Behavioural self-regulation, Cognitive self-regulation and Emotional self-regulation.

Introduction

The models discussed in this chapter explore the relationship between the quality of the Formal group ECEC settings that children attended between ages 2 and 4 and children's cognitive and socio-emotional outcomes at age 5. Models explore how these effects differ between the disadvantaged and the least disadvantaged children.

Method

Children's cognitive and socio-emotional outcomes at age 5 were analysed in terms of the quality of the Formal group ECEC settings that children attended between ages 2 and 4. Quality of ECEC settings was assessed using three measures:

- Sustained Shared Thinking and Emotional Well-being scale (SSTEW)
- Early Childhood Environment Rating Scale – Revised (ECERS-R)
- Early Childhood Environment Rating Scale – Extension (ECERS-E)

Separate models for ECEC quality were fitted for the disadvantaged and least disadvantaged children.

Models controlled for ECEC use, and for demographic and home environment covariates (for more information, see the methodology section), and were fitted to complete cases data.

Results

Results are shown in Table 6 (disadvantaged children) and Table 7 (least disadvantaged children).

Table 6: Results of regression models of outcomes in terms of formal group ECEC quality; effects for disadvantaged children.

Outcome	SSTEW		ECERS-R		ECERS-E	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	+0.040	0.630	+0.059	0.462	-0.006	0.943
BAS non-verbal score	+0.120	0.178	+0.093	0.277	+0.181	0.043*
Sociability	+0.210	0.039*	+0.226	0.025*	+0.189	0.063
Externalising behaviour	-0.083	0.405	-0.138	0.164	-0.116	0.245
Internalising behaviour	-0.034	0.735	-0.081	0.420	-0.051	0.615
Prosocial behaviour	+0.168	0.093	+0.255	0.010*	+0.207	0.039*
Behavioural self-regulation	+0.152	0.137	+0.244	0.016*	+0.182	0.076
Cognitive self-regulation	+0.140	0.153	+0.236	0.015*	+0.175	0.074
Emotional self-regulation	+0.101	0.319	+0.207	0.039*	+0.141	0.166

Sample size = 821 (cognitive outcomes) = 677 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

Table 7: Results of regression models of outcomes in terms of formal group ECEC quality; effects for least disadvantaged children.

Outcome	SSTEW		ECERS-R		ECERS-E	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	+0.069	0.490	+0.121	0.237	+0.001	0.989
BAS non-verbal score	+0.151	0.158	+0.249	0.022*	+0.275	0.010*
Sociability	-0.004	0.971	+0.062	0.616	+0.085	0.483
Externalising behaviour	+0.029	0.806	-0.036	0.767	-0.046	0.704
Internalising behaviour	+0.041	0.732	-0.017	0.888	-0.066	0.586
Prosocial behaviour	+0.041	0.732	+0.081	0.503	+0.113	0.346
Behavioural self-regulation	-0.076	0.531	+0.021	0.865	+0.061	0.617
Cognitive self-regulation	-0.027	0.819	-0.004	0.973	+0.072	0.540
Emotional self-regulation	-0.065	0.587	+0.059	0.632	+0.044	0.716

Sample size = 821 (cognitive outcomes) = 677 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

Discussion

Cognitive outcomes

There were significant associations found between children's attending higher quality Formal group ECEC between ages 2 and 4 and better child outcomes at age 5 for BAS non-verbal ability (see Tables 6 and 7). This was found for the quality measures ECERS-E (all children) and for the ECERS-R measure (least disadvantaged children only).

Socio-emotional outcomes

There were no statistically significant associations between ECEC quality and the socio-emotional outcomes for the least disadvantaged children (Table 7).

For disadvantaged children, there were a number of associations between attending higher quality Formal group ECEC between ages 2 and 4 and better socio-emotional outcomes at age 5. The SSTEW quality measure was associated with child Sociability, the ECERS-E measure was associated with child Prosocial behaviour, whilst the ECERS-R quality measure was associated with Sociability, Prosocial behaviour, Behavioural self-regulation, Cognitive self-regulation and Emotional self-regulation.

Conclusion

The quality of the group care attended by disadvantaged children between ages 2 and 4 appears to be of great importance for their socio-emotional development. The absence of similar effects of quality for the least disadvantaged children may be another example of a "saturation effect", where the least disadvantaged children tend to have access to more educationally stimulating situations outside formal ECEC, and so are less dependent on out of home care for their educational and social development.

Investigating the interaction between quantity and quality of Formal group ECEC

Introduction

The aim was to explore possible interactions between the effects of the quantity and quality of Formal group ECEC that children received between ages 2 and 4 and their age 5 cognitive and socio-emotional outcomes.

Method

Note that only a subsample of children had ECEC quality measures. Hence, the numbers in analysis groups are not as high as in the quantity only analyses in chapter 2. The principal covariate was a 6 level factor combining the quantity and quality of Formal group ECEC which children received between ages 2 and 4:

1. Low quantity (up to 10 hours per week ECEC); low quality.
2. Low quantity (up to 10 hours per week ECEC); high quality.
3. Medium quantity (>10 to 20 hours per week ECEC); low quality.
4. Medium quantity (>10 to 20 hours per week ECEC); high quality.
5. High quantity (>20 hours per week ECEC); low quality.
6. High quantity (>20 hours per week ECEC); high quality.

Low quality was defined as "less than or equal to the mean", and High quality was defined as "greater than the mean". The quality measure used was the mean of the SSTEW, ECERS-R and ECERS-E scores.

The cognitive and socio-emotional outcomes were analysed in terms of the quantity / quality factor, with separate effects for disadvantaged and least disadvantaged children. Models controlled for Formal individual and Informal individual ECEC use and for demographic and home environment variables, and used complete cases data.

Results

The numbers of children in each level of the quantity / quality factor are in Table 8. The results of the models are shown graphically in Figures 10 to 18 (disadvantaged children) and in Figures 19 to 27 (least disadvantaged children). The low quantity / low quality children are the reference group throughout. Statistically significant / borderline statistically significant effects are marked with stars in the conventional way: (*) = $p < 0.1$, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

Table 8: Breakdown of sample by Formal group ECEC band and quality band.

Formal group ECEC hours/week	Disadvantaged		Least disadvantaged	
	Low qual.	High qual.	Low qual.	High qual.
Up to 10	77	88	47	79
>10 to 20	137	142	71	100
>20	51	53	38	50

Figure 10: Model of outcome BAS verbal score; Disadvantaged children.

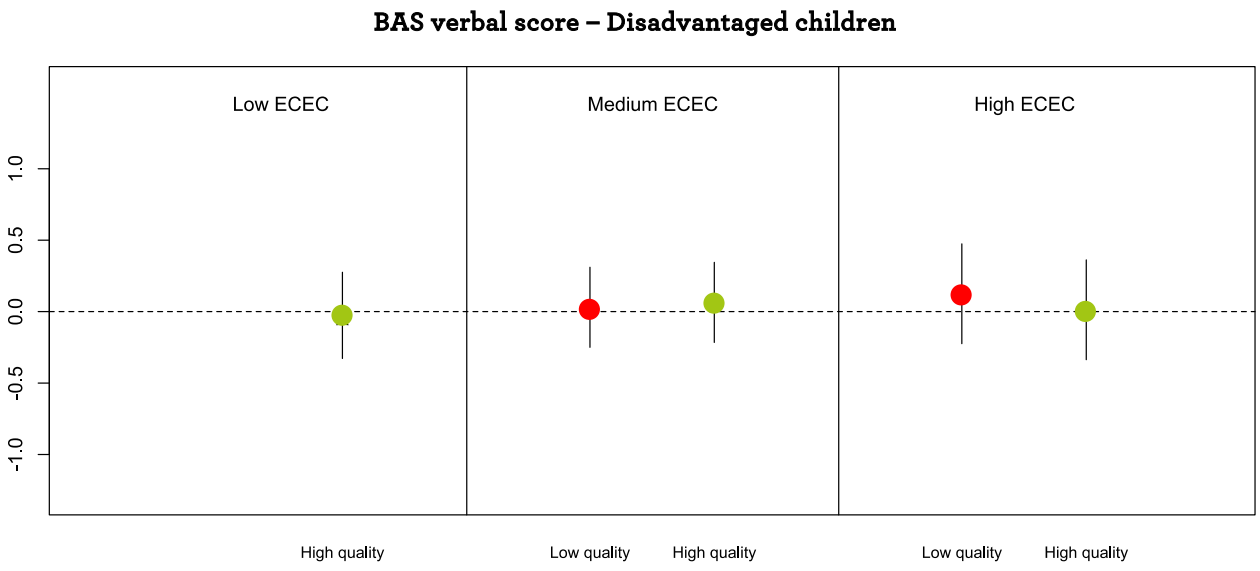


Figure 11: Model of outcome BAS non-verbal score; Disadvantaged children.

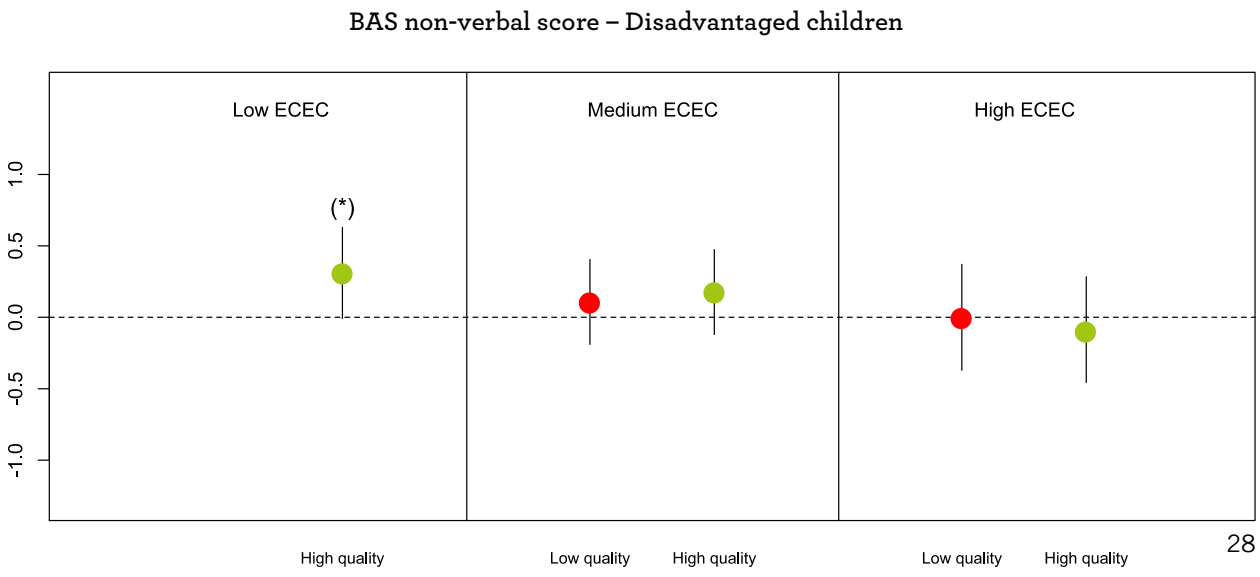


Figure 12: Model of outcome Sociability; Disadvantaged children.

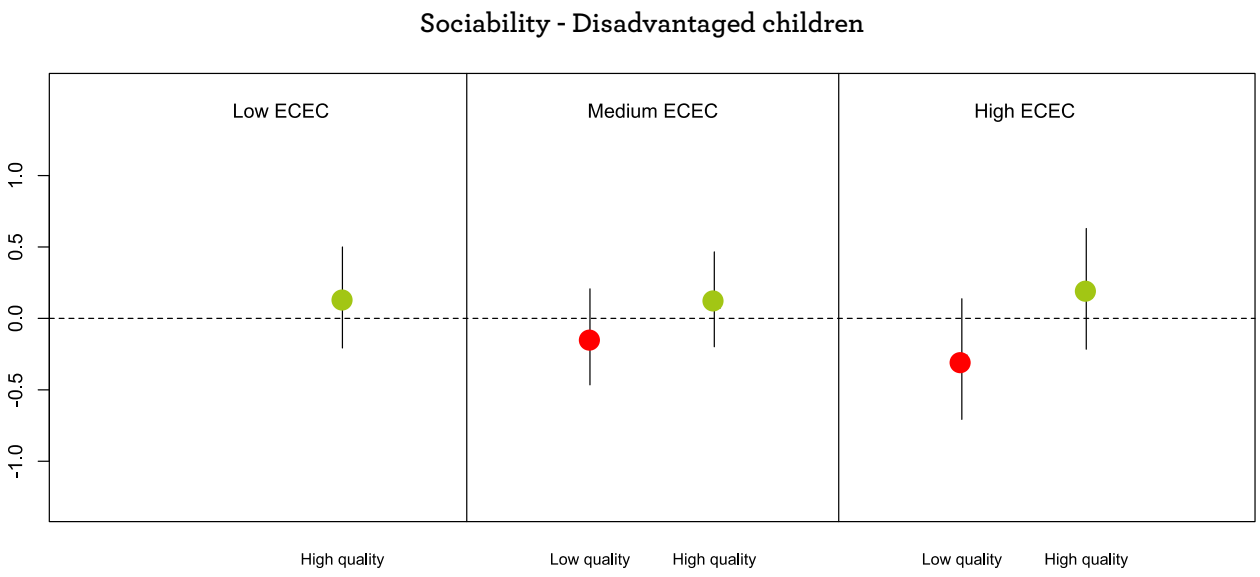


Figure 13: Model of outcome Externalising behaviour; Disadvantaged children.

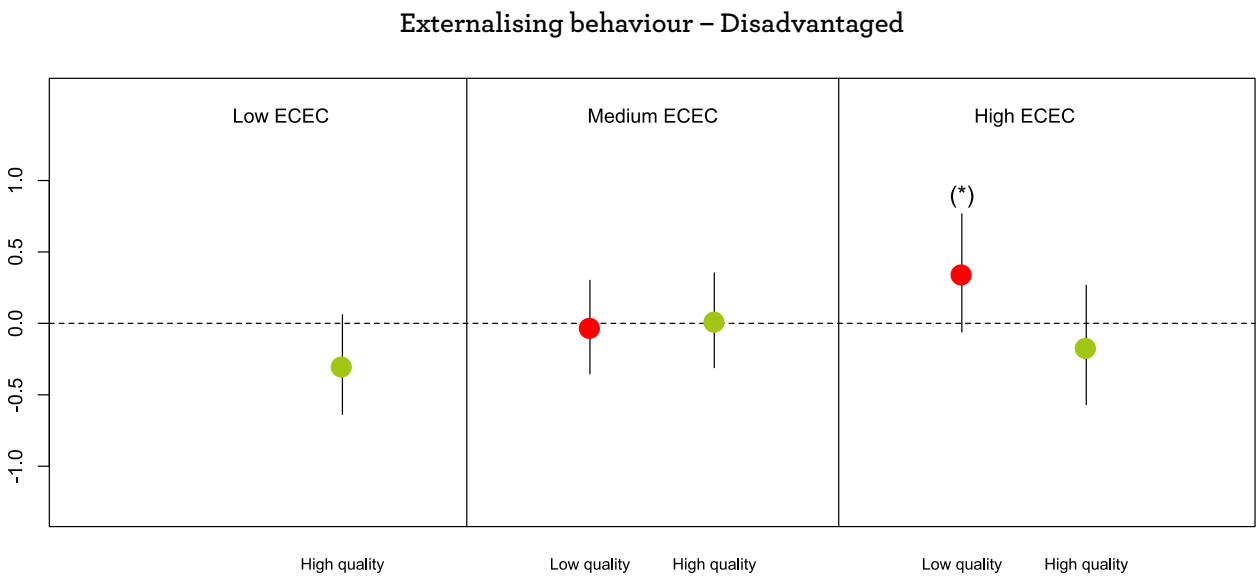


Figure 14: Model of outcome Internalising behaviour; Disadvantaged children.

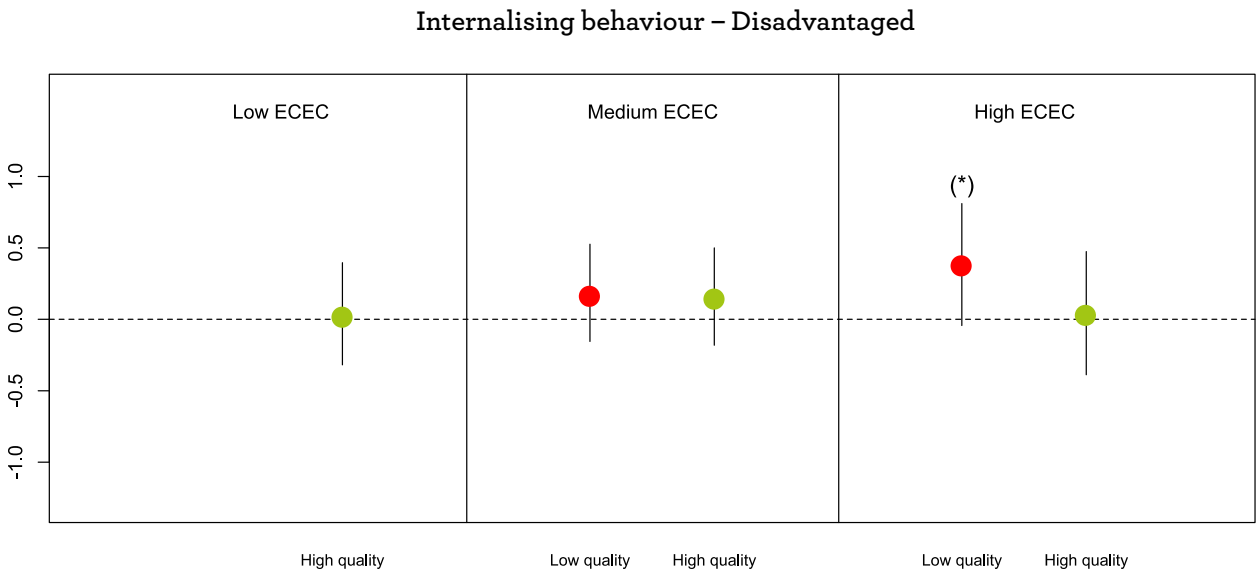


Figure 15: Model of outcome Prosocial behaviour; Disadvantaged children

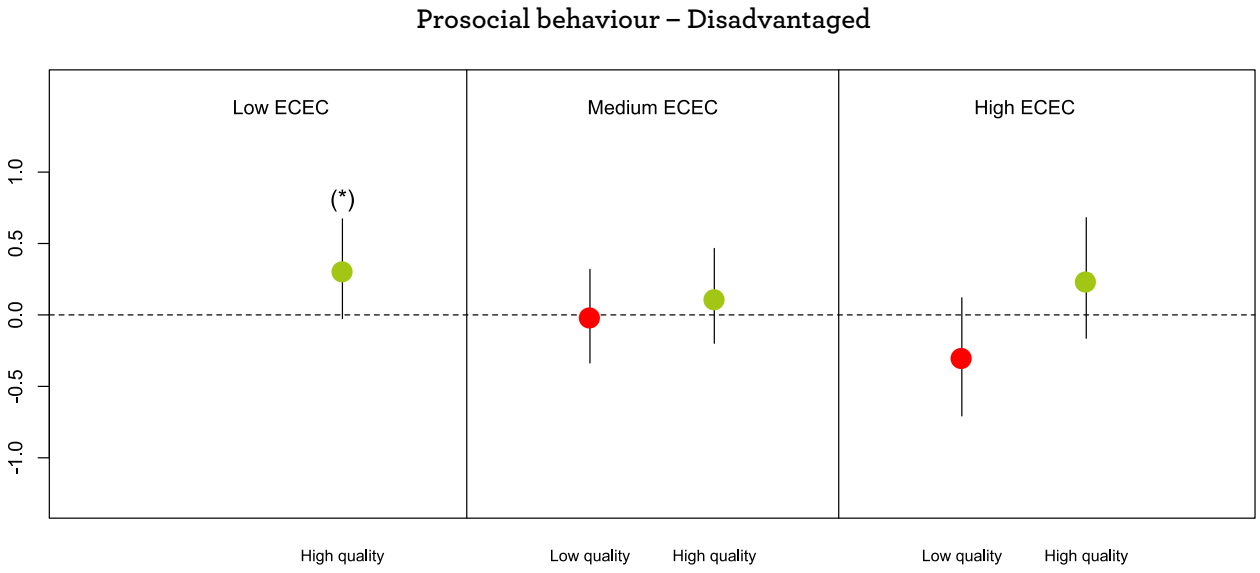


Figure 16: Model of outcome Behavioural self-regulation; Disadvantaged children.

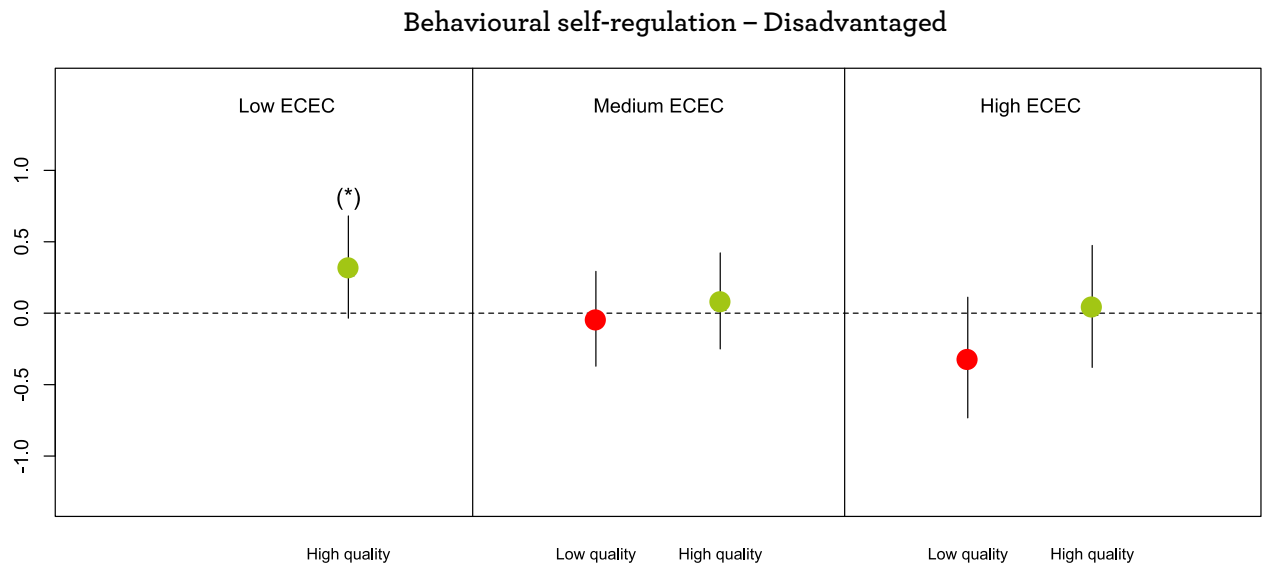


Figure 17: Model of outcome Cognitive self-regulation; Disadvantaged children.

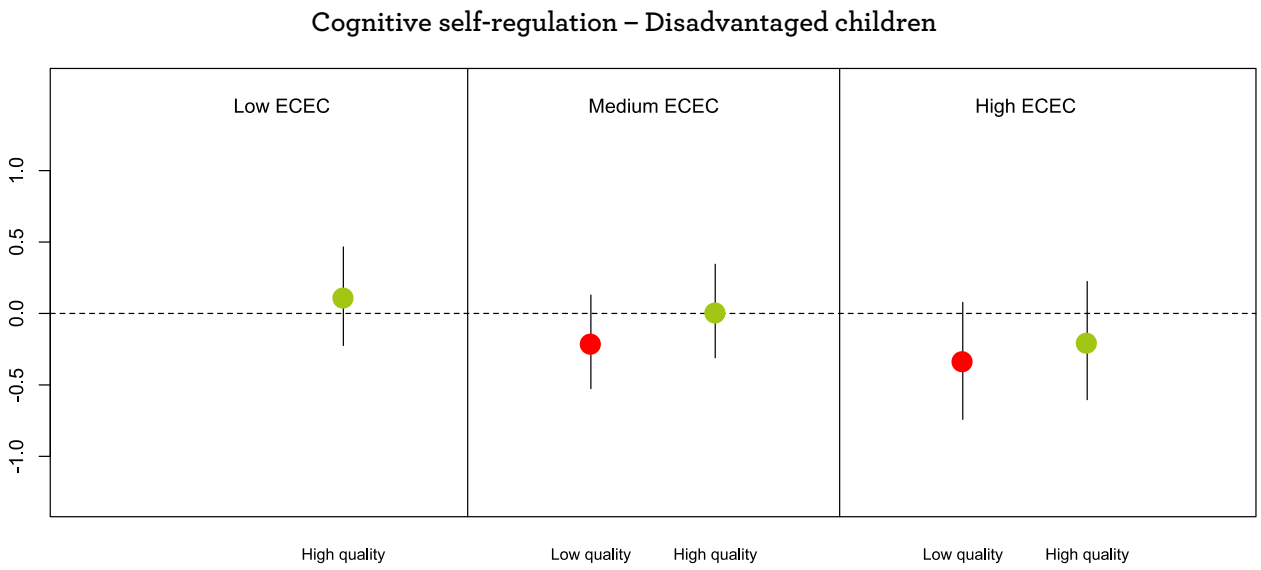


Figure 18: Model of outcome Emotional self-regulation; Disadvantaged children.

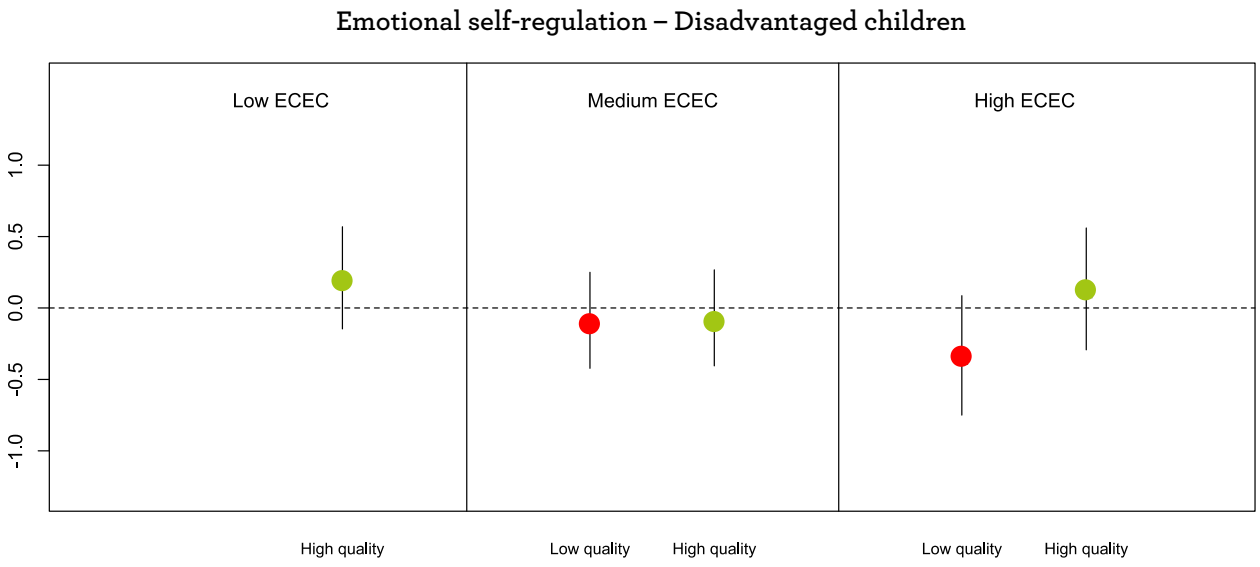


Figure 19: Model of outcome BAS verbal score; Least disadvantaged children.

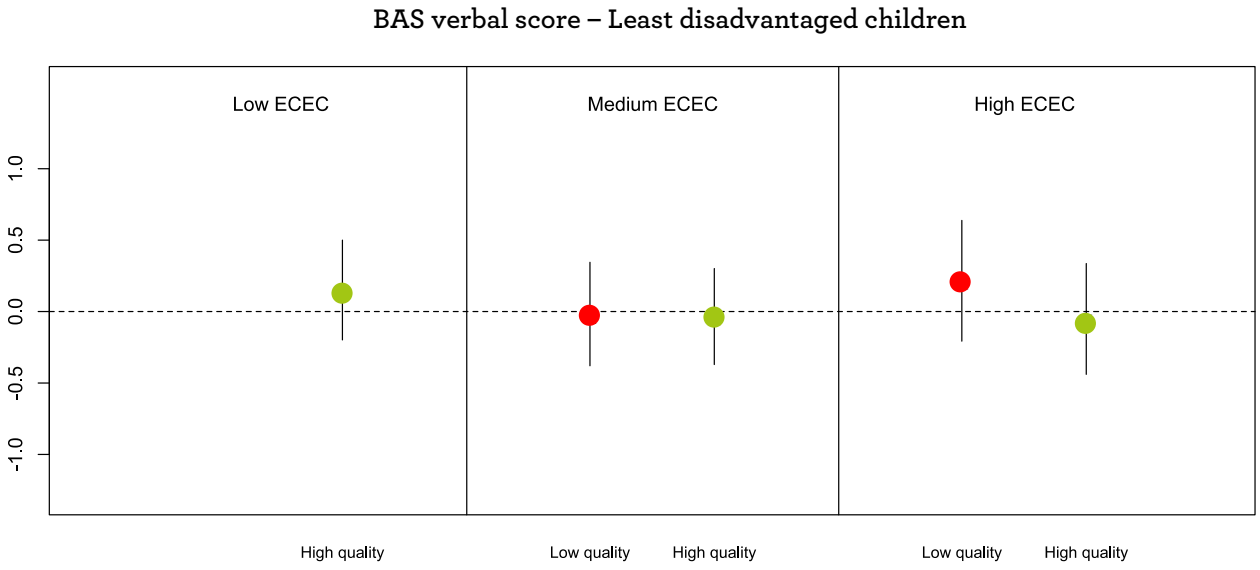


Figure 20: Model of outcome BAS non-verbal score; Least disadvantaged children.

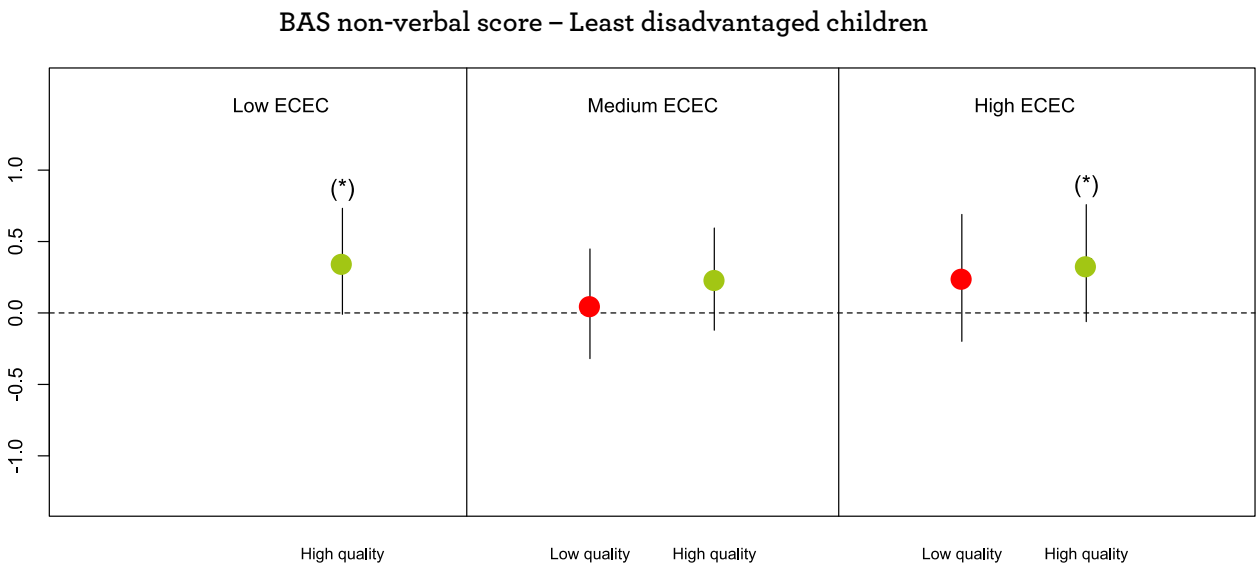


Figure 21: Model of outcome Sociability; Least disadvantaged children.

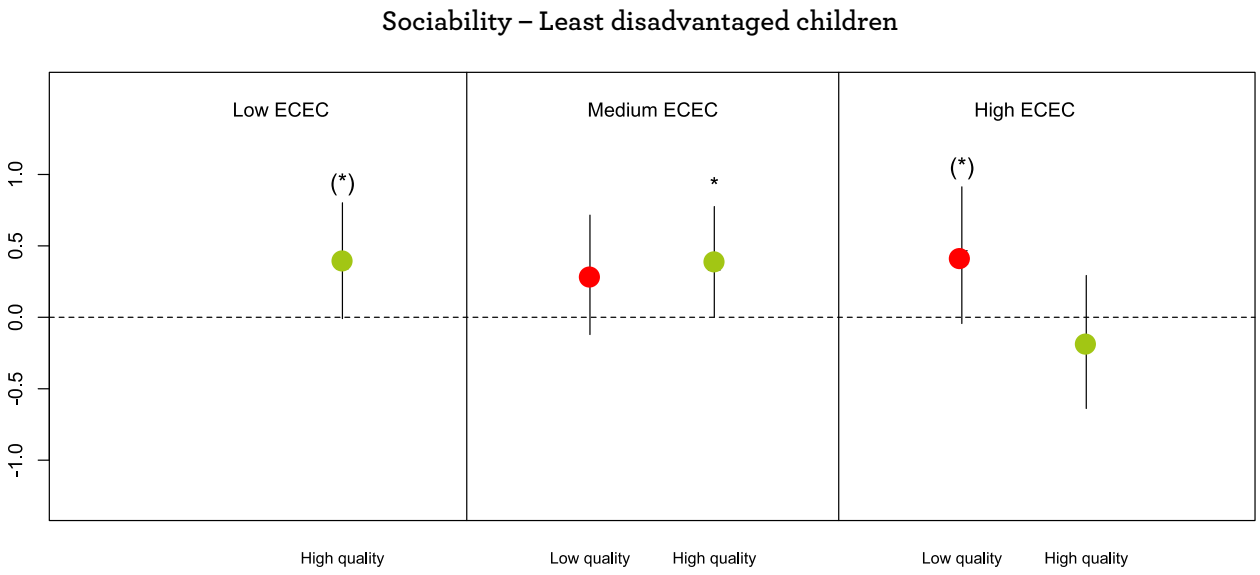


Figure 22: Model of outcome Externalising behaviour; Least disadvantaged children.

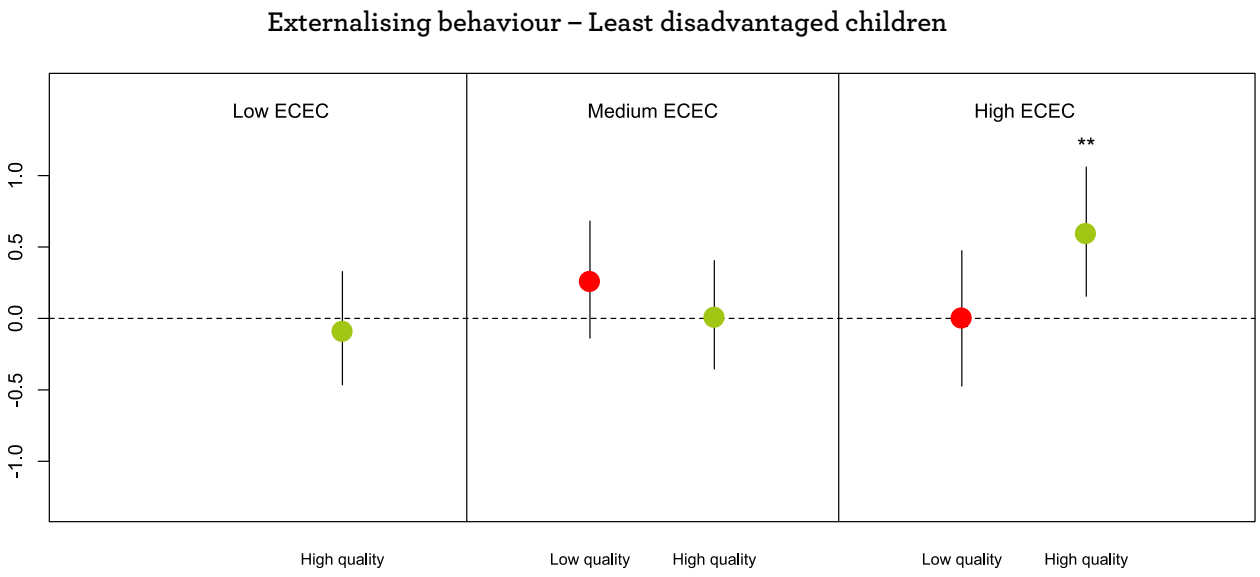


Figure 23: Model of outcome Internalising behaviour; Least disadvantaged children.

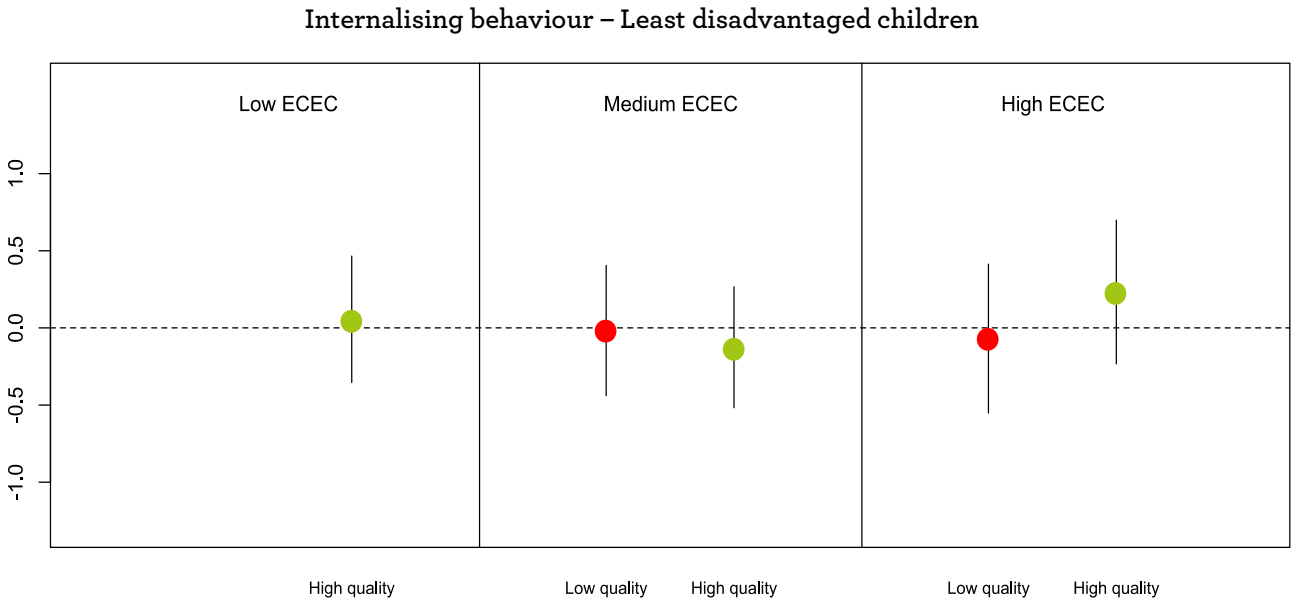


Figure 24: Model of outcome Prosocial behaviour; Least disadvantaged children.

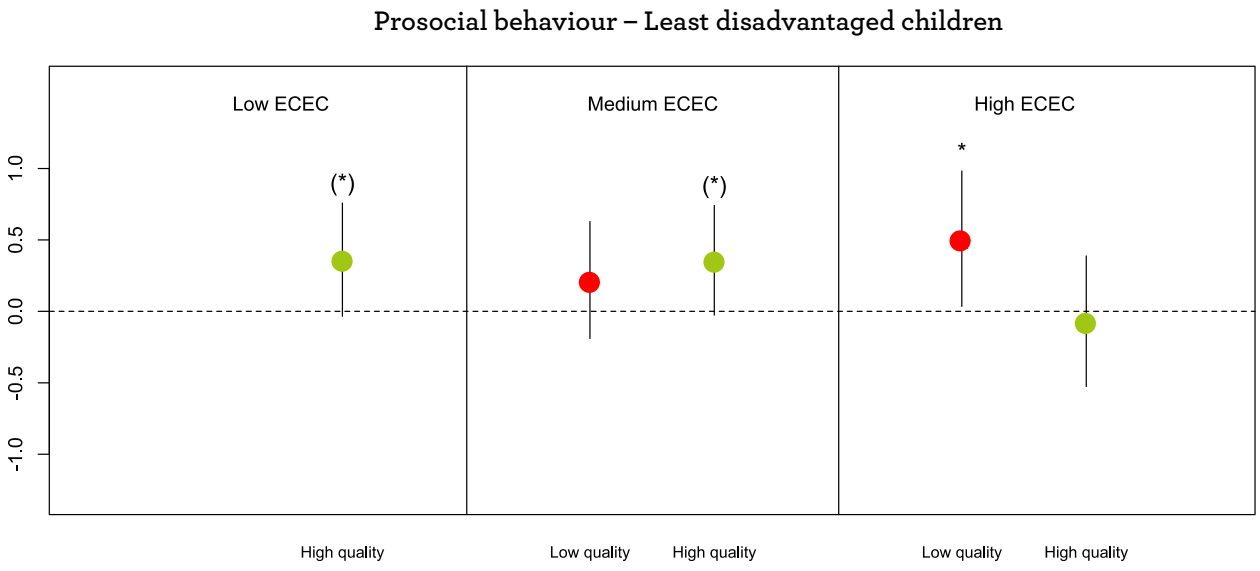


Figure 25: Model of outcome Behavioural self-regulation; Least disadvantaged children.

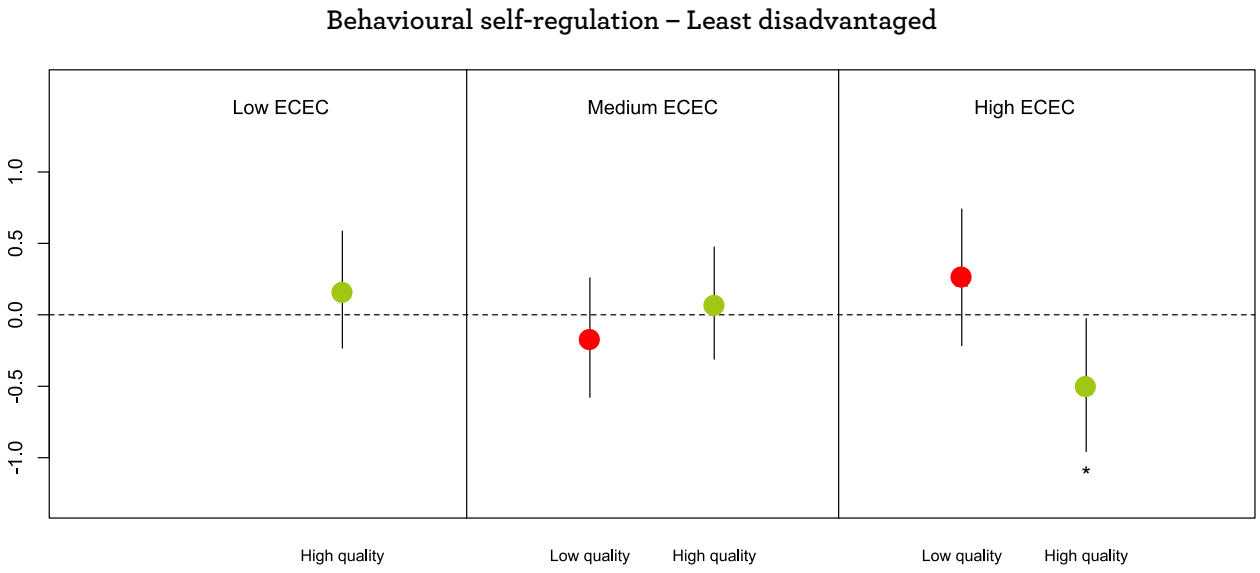


Figure 26: Model of outcome Cognitive self-regulation; Least disadvantaged children.

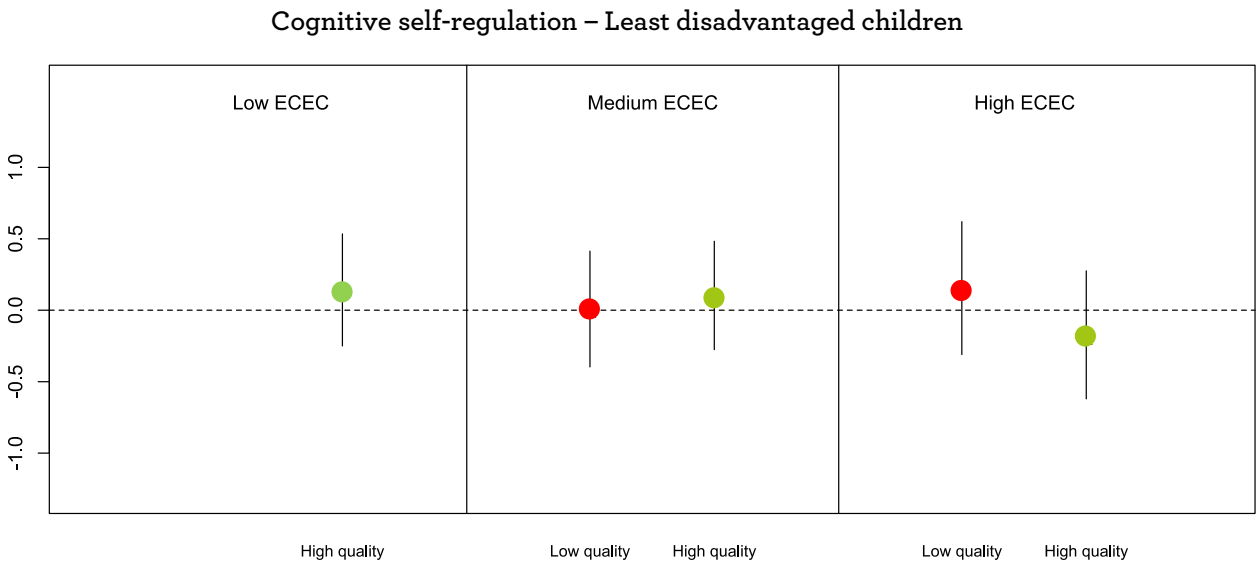
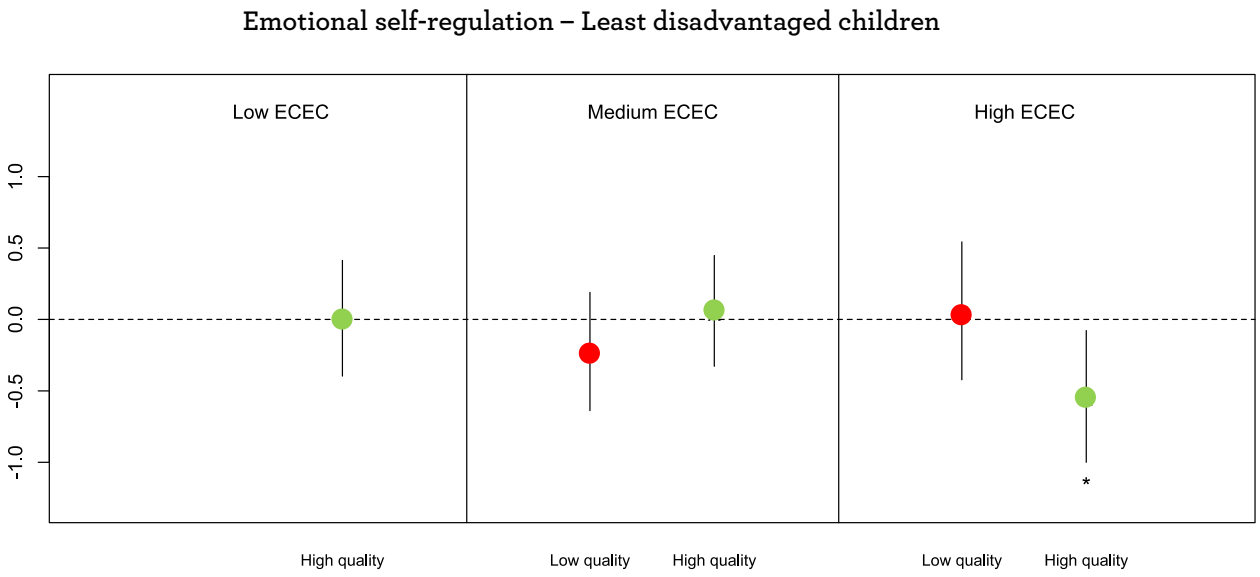


Figure 27: Model of outcome Emotional self-regulation; Least disadvantaged children.



Hours and quality - summary of results

Disadvantaged children

Children receiving a low quantity of high quality Formal group ECEC between age 2 and 4 were likely to show some benefits on some cognitive and socio-emotional outcomes at age 5 as compared to the low quantity / low quality reference group. Specifically, this was found for BAS non-verbal score (Figure 11), Prosocial behaviour (Figure 15), and Behavioural self-regulation (Figure 16).

Children receiving a high quantity of low quality ECEC between age 2 and 4 were likely to show some poorer socio-emotional outcomes as compared to the low quantity / low quality reference group. This was found for the outcomes Externalising behaviour (Figure 13) and Internalising behaviour (Figure 14).

Least disadvantaged children

Children who received high quality Formal group ECEC between ages 2 and 4 were likely to show better BAS non-verbal scores; this effect was statistically significant for low or high quantities of high quality Formal group ECEC (Figure 20).

There were also some socio-emotional benefits associated with ECEC quality for the outcomes Sociability (Figure 21) and Prosocial behaviour (Figure 24). As compared to the low quantity / low quality reference group, children experiencing low and medium amounts of high quality Formal group ECEC between ages 2 and 4 showed better outcomes. Also, children who experienced a high amount of low quality Formal group ECEC were likely to show some socio-emotional benefits as compared to the low quantity / low quality reference group.

However, for some socio-emotional outcomes children who experienced a high quantity of high quality Formal group ECEC between ages 2 and 4 were likely to show poorer age 5 outcomes than the low quantity / low quality reference group; this was found for Externalising behaviour (Figure 22), Behavioural self-regulation (Figure 25) and Emotional self-regulation (Figure 27).

Hours and quality - discussion

Disadvantaged children

The results for the disadvantaged children are in line with what might be expected. There are likely to be cognitive and socio-emotional benefits for children receiving a low quantity of high quality Formal group ECEC as compared to those receiving a low quantity of low quality ECEC. There is also the likelihood of socio-emotional disadvantages for children receiving a high quantity of low quality Formal group ECEC as compared to those receiving a low quantity of low quality ECEC.

Least disadvantaged children

For the least disadvantaged children, there is evidence of potential for cognitive and socio-emotional benefits from a low to medium quantity of high quality Formal group ECEC as compared to a low quantity of low quality ECEC. There is also the likelihood of cognitive benefits associated with a high quantity of high quality Formal group ECEC as compared to a low quantity of low quality ECEC. These results are as might be expected.

However, for the least disadvantaged children the evidence is mixed. For socio-emotional outcomes, there are socio-emotional benefits (specifically for Sociability and Prosocial behaviour) associated with a high quantity of low quality Formal group ECEC but socio-emotional disadvantages (specifically for Externalising behaviour, Behavioural and Emotional self-regulation) associated with a high quantity of high quality ECEC.

A tentative explanation of the unexpected results for the least disadvantaged children

It is possible that the explanation for these results – if they are genuine and not an anomaly of some kind – may lie in providing an optimum amount of adult attention for pre-school children. If one aspect of high quality ECEC is a high level of adult attention, the effects of this ECEC may differ according to the home experience of children. Specifically, disadvantaged children (who on average are experiencing less focussed adult attention at home) may derive socio-emotional benefits from the additional attention provided in any high quality Formal group ECEC that they attend. On the other hand, the least disadvantaged children (who on average are experiencing more focussed adult attention at home) may, if they also attend a large amount of high quality Formal group ECEC, experience too much adult attention and run the risk of subsequent socio-emotional disadvantage. (In colloquial terms, these children may become “spoilt”).

Alternatively, the negative socio-emotional effects for high amounts of high quality Formal group ECEC may reflect the earlier results of the negative influence of high levels of Formal group ECEC overall.

This issue could be explored further by examining which specific item level quality scores are most strongly associated with the poorer socio-emotional outcome for the least disadvantaged children who are experiencing a high level of Formal group ECEC.

The Home Learning Environment

Key Findings

- Higher family home learning environment (HLE) scores are associated with better verbal ability at age 5 for disadvantaged and least disadvantaged children.
- For disadvantaged children, higher HLE scores are associated with better Behavioural self-regulation at age 5.
- For disadvantaged children, higher HLE scores help to prevent the poorer age 5 socio-emotional outcomes which are otherwise associated with high Formal group ECEC use between age 3 and the start of school.
- For the least disadvantaged children, higher HLE scores are associated with poorer socio-emotional outcomes at age 5 for Sociability, Externalising behaviour and Emotional self-regulation.

Introduction

The models discussed in this chapter explore the relationship between the Home Learning Environment (HLE) that children experience aged 2 to 4 and children's cognitive and socio-emotional outcomes at age 5. In addition, the effects associated with the interaction between HLE and ECEC are considered. Models explore how these effects differ between the disadvantaged and the least disadvantaged children.

Methods

Initial models analysed children's age 5 outcomes in terms of mean family HLE score measured when children were aged between 2 and 4 years old. Models controlled for ECEC use, and home environment and demographic covariates. Separate effects of HLE were fitted for the disadvantaged and the least disadvantaged children.

Exploratory analysis indicated that the effect of HLE might vary according to the level of Formal group ECEC to which children were exposed between age 3 and the start of school; i.e. there appeared to be an interaction between the effects of HLE and Formal group ECEC. A second set of models was fitted including an interaction term between HLE and Formal group ECEC. Separate effects were fitted for the disadvantaged and the least disadvantaged children.

In order to clarify the implication of the interactions between HLE and Formal group ECEC use, a final set of models was fitted in terms of a combined HLE / Formal group ECEC factor. The following 9-level factor was defined:

1. Low Formal group ECEC use (up to 15 hours per week) and low HLE (up to 27)
2. Low Formal group ECEC use (up to 15 hours per week) and medium HLE (>27 to 33)
3. Low Formal group ECEC use (up to 15 hours per week) and high HLE (>33)
4. Medium Formal group ECEC use (>15 to 20 hours per week) and low HLE (up to 27)
5. Medium Formal group ECEC use (>15 to 20 hours per week) and medium HLE (>27 to 33)
6. Medium Formal group ECEC use (>15 to 20 hours per week) and high HLE (>33)
7. High Formal group ECEC use (>20 hours per week) and low HLE (up to 27)
8. High Formal group ECEC use (>20 hours per week) and medium HLE (>27 to 33)

9. High Formal group ECEC use (>20 hours per week) and high HLE (>33)

The cut-offs used to divide Formal group ECEC and HLE into low, medium and high bands were chosen to be approximately the tertiles of the distributions.

Children's age 5 outcomes were regressed on this Formal group ECEC / HLE factor, with the low Formal group ECEC / low HLE children used as the reference group. Models controlled for Formal individual ECEC use, Informal individual ECEC use and home environment and demographic variables (for more information, see the methodology section). Models were fitted to complete cases data.

Results

The results of the initial models of outcomes in terms of HLE are shown in Table 9. The results of the models including an HLE / Formal group ECEC interaction are shown in Table 10 (disadvantaged children) and Table 11 (least disadvantaged children).

Breakdowns of the sample in terms of the HLE / Formal group ECEC factor are given in Table 12 (children with cognitive outcomes) and in Table 13 (children with socio-emotional outcomes).

Because there were no significant interactions found between the effects of Formal group ECEC and HLE for the least disadvantaged children (Table 11), results for the models in terms of the 9-level Formal group ECEC / HLE factor are given for the disadvantaged children only; see Table 14 and Figures 28 to 36.

Table 9: Models of children's age 5 outcomes in terms of home learning environment.

Outcome	Home learning environment			
	Disadvantaged		Least disadvantaged	
	Beta	p-value	Beta	p-value
BAS verbal score	+0.187	<0.001***	+0.162	0.004**
BAS non-verbal score	+0.091	0.067	-0.034	0.579
Sociability	-0.028	0.611	-0.170	0.011*
Externalising behaviour	-0.036	0.511	+0.206	0.002**
Internalising behaviour	+0.050	0.391	+0.090	0.199
Prosocial behaviour	+0.056	0.300	-0.030	0.649
Behavioural self-regulation	+0.109	0.044*	-0.079	0.225
Cognitive self-regulation	+0.080	0.138	+0.046	0.476
Emotional self-regulation	+0.036	0.513	-0.225	<0.001***

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Table 10: Models of children's age 5 outcomes in terms of formal group ECEC, home learning environment and their interaction. Results for disadvantaged children.

Outcome	Formal Group ECEC		HLE		Interaction	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	+0.027	0.564	+0.179	<0.001***	-0.099	0.022*
BAS non-verbal score	-0.009	0.858	+0.087	0.082	-0.049	0.289
Sociability	-0.043	0.432	-0.022	0.696	+0.122	0.015*
Externalising behaviour	+0.137	0.012*	-0.043	0.432	-0.118	0.017*
Internalising behaviour	+0.128	0.026*	+0.041	0.477	-0.134	0.010**
Prosocial behaviour	-0.055	0.307	+0.062	0.254	+0.106	0.030*
Behavioural self-regulation	-0.095	0.074	+0.113	0.037*	+0.078	0.107
Cognitive self-regulation	-0.012	0.826	+0.084	0.121	+0.072	0.137
Emotional self-regulation	-0.139	0.010**	+0.044	0.418	+0.132	0.007**

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Table 11: Models of children's age 5 outcomes in terms of formal group ECEC, home learning environment and their interaction. Results for least disadvantaged children.

Outcome	Formal Group ECEC		HLE		Interaction	
	Beta	p-value	Beta	p-value	Beta	p-value
BAS verbal score	-0.008	0.883	+0.165	0.004**	-0.024	0.658
BAS non-verbal score	+0.080	0.160	-0.036	0.557	+0.023	0.693
Sociability	-0.053	0.399	-0.176	0.009**	+0.038	0.549
Externalising behaviour	+0.201	0.001**	+0.204	0.002**	+0.023	0.721
Internalising behaviour	+0.058	0.370	+0.083	0.239	+0.060	0.365
Prosocial behaviour	-0.083	0.172	-0.035	0.595	+0.036	0.566
Behavioural self-regulation	-0.135	0.026*	-0.082	0.212	+0.018	0.770
Cognitive self-regulation	-0.042	0.488	+0.043	0.509	+0.020	0.743
Emotional self-regulation	-0.187	0.002**	-0.217	0.001**	-0.071	0.257

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Statistically significant results are highlighted in pink: * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

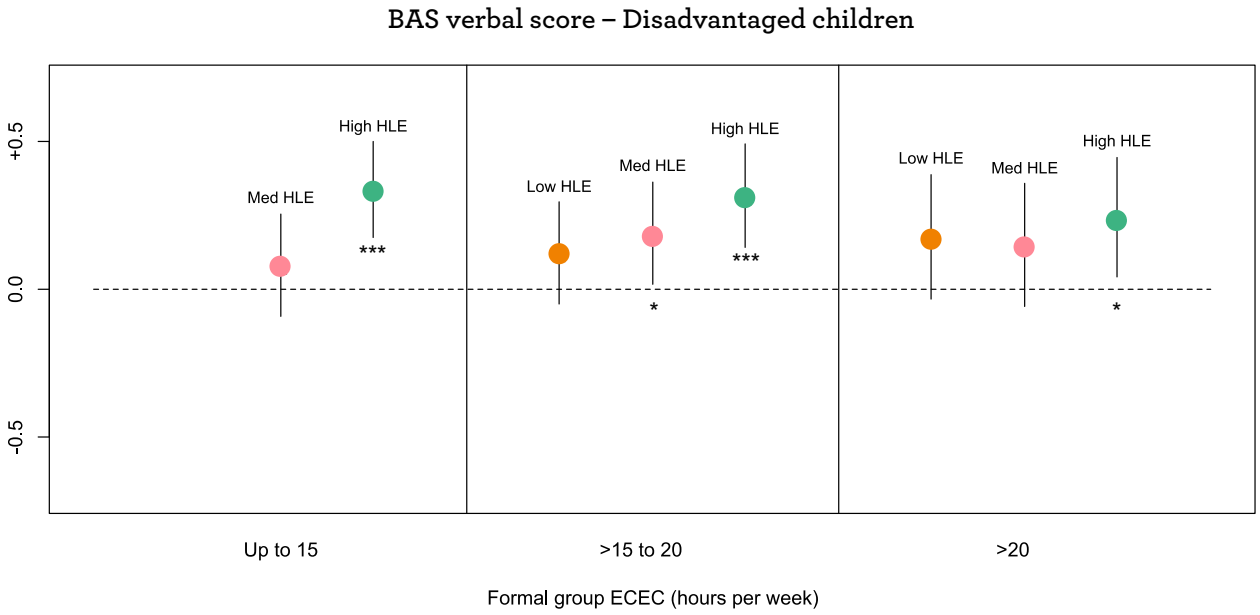
Table 12: Breakdown of sample by levels of Formal group ECEC use and Home learning environment; children with BAS outcomes.

Disadvantaged				
		HLE level		
		Up to 27	>27 to 33	>33
Formal group ECEC level	Up to 15	232	191	266
	>15 to 20	194	187	191
	>20	104	107	120
Least disadvantaged				
		HLE level		
		Up to 27	>27 to 33	>33
Formal group ECEC level	Up to 15	151	161	165
	>15 to 20	112	129	138
	>20	112	113	105

Table 13: Breakdown of sample by levels of Formal group ECEC use and Home learning environment; children with teacher assessed socio-emotional outcomes.

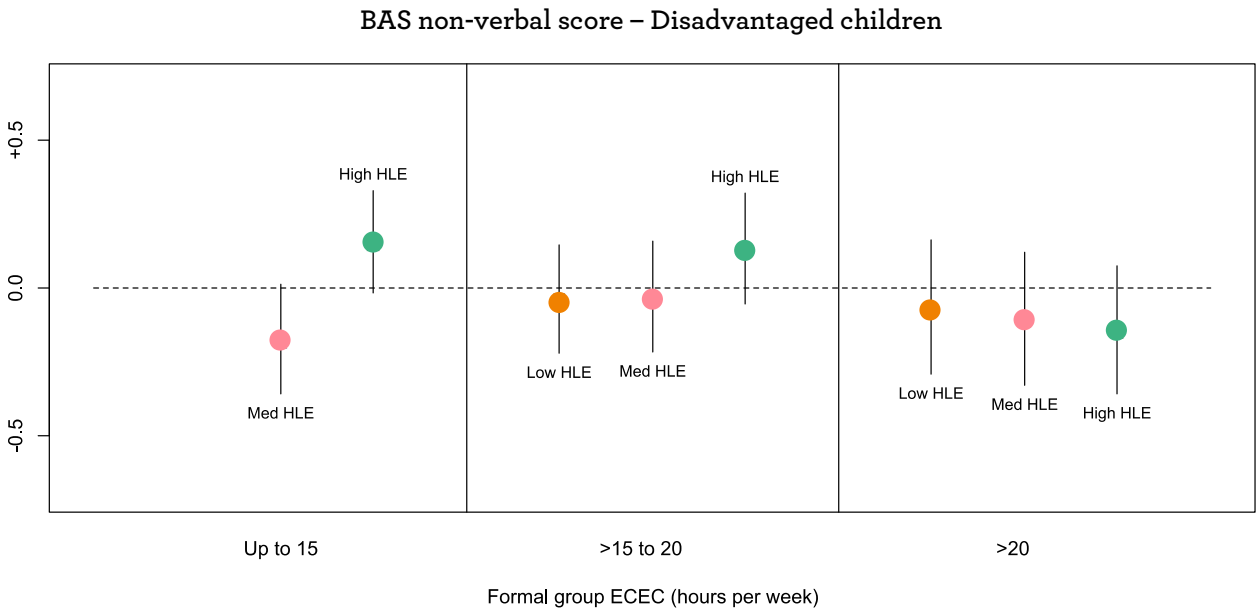
Disadvantaged				
		HLE level		
		Up to 27	>27 to 33	>33
Formal group ECEC level	Up to 15 hpw	185	157	201
	>15 to 20 hpw	158	156	154
	>20 hpw	82	93	103
Least disadvantaged				
		HLE level		
		Up to 27	>27 to 33	>33
Formal group ECEC level	Up to 15 hpw	119	126	140
	>15 to 20 hpw	90	119	108
	>20 hpw	94	91	85

Figure 28: Graphical summary of results for outcome BAS verbal score; disadvantaged children.



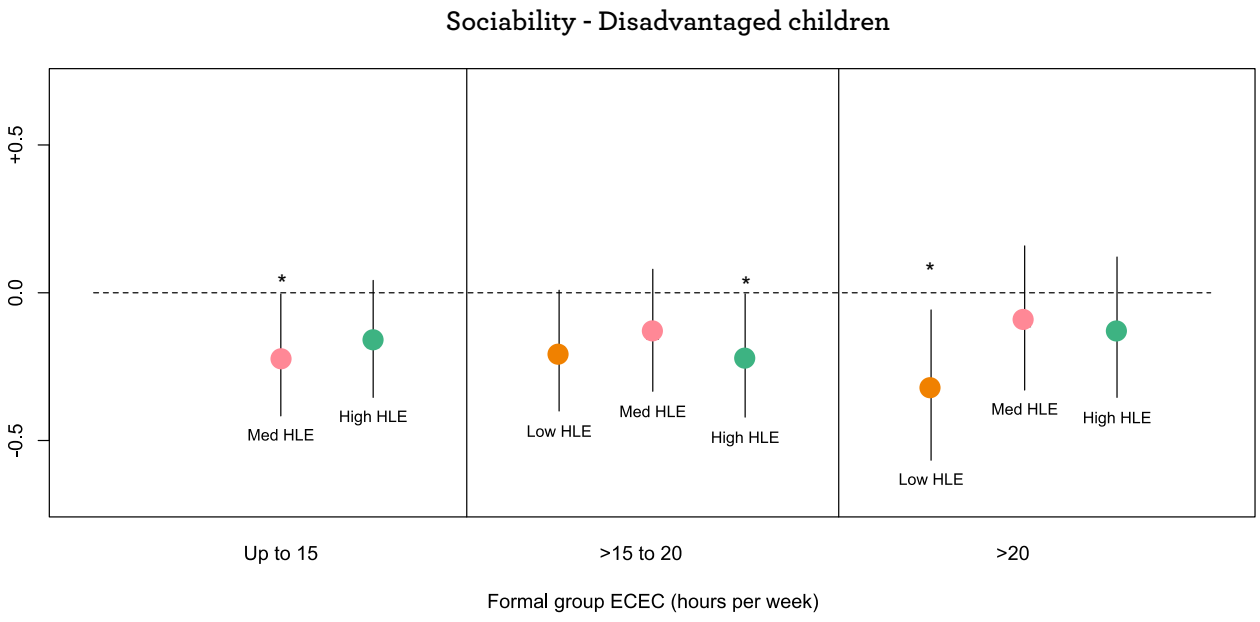
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 29: Graphical summary of results for outcome BAS non-verbal score; disadvantaged children.



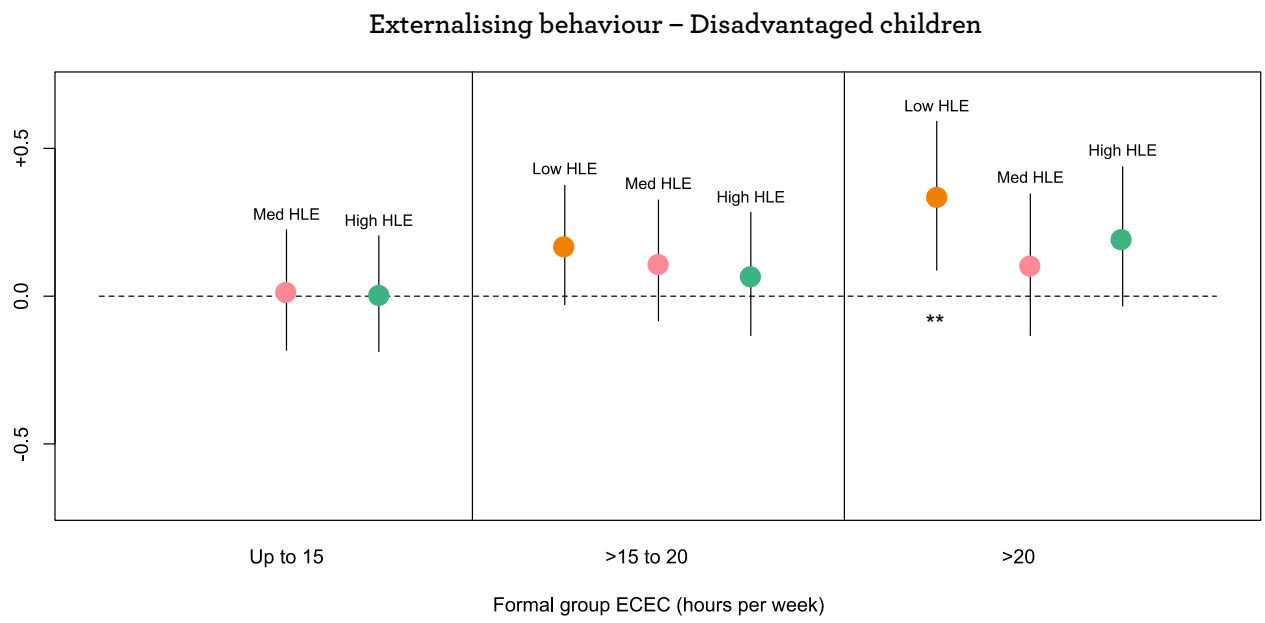
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 30: Graphical summary of results for outcome Sociability; disadvantaged children.



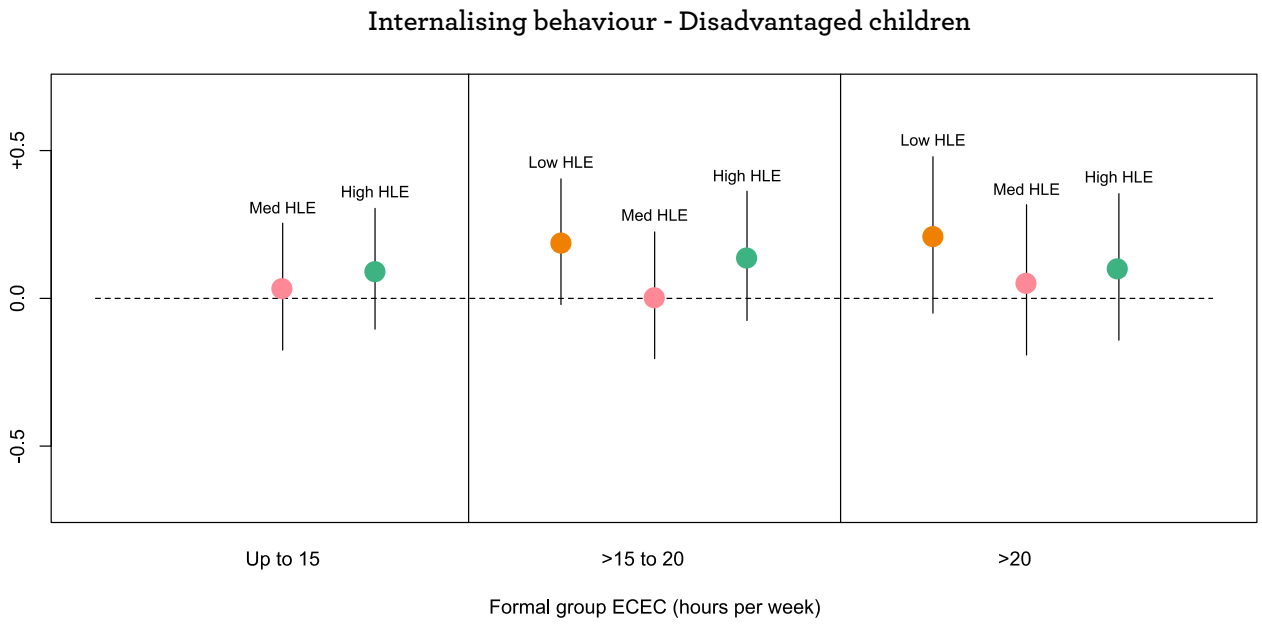
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 31: Graphical summary of results for outcome Externalising behaviour; disadvantaged children.



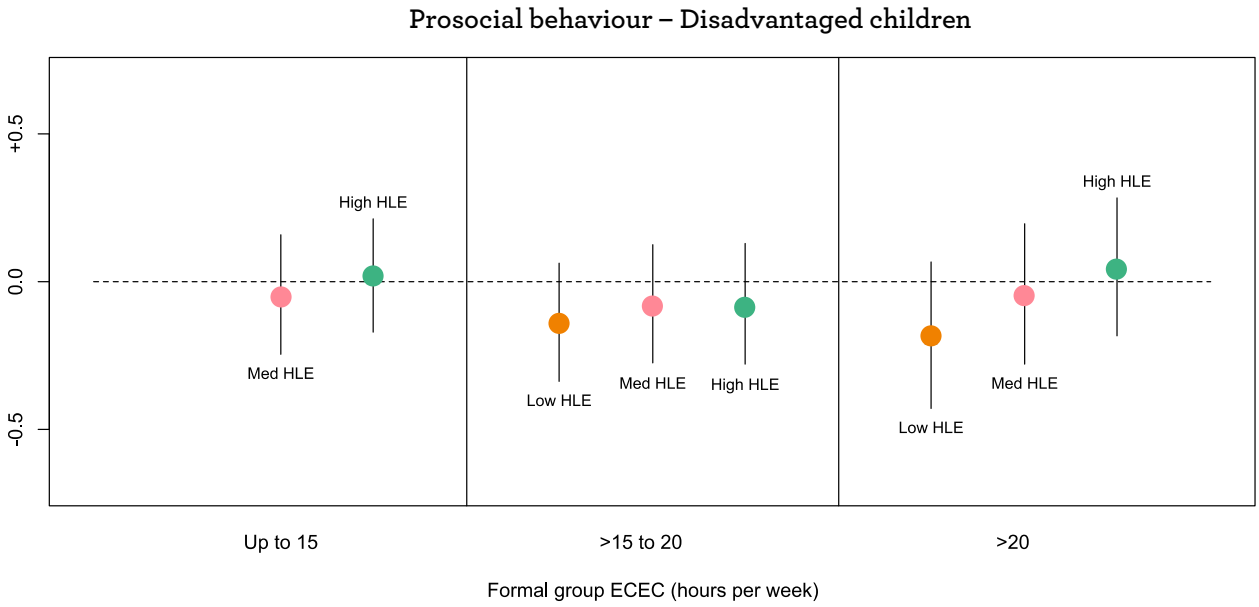
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 32: Graphical summary of results for outcome Internalising behaviour; disadvantaged children.



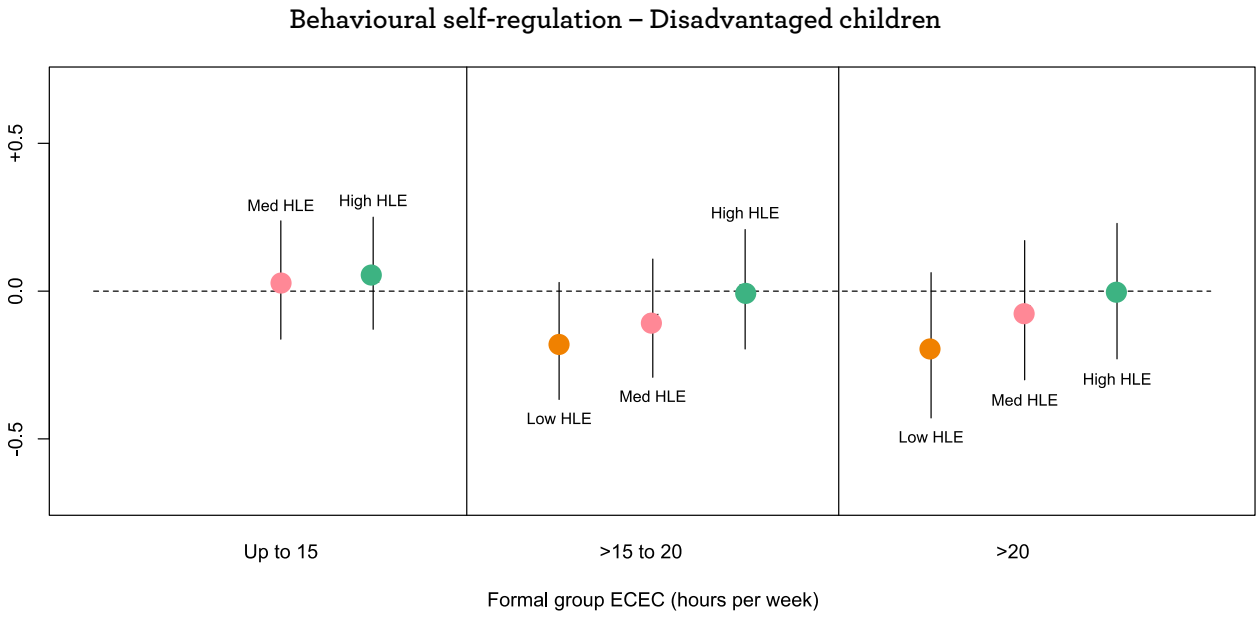
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 33: Graphical summary of results for outcome Prosocial behaviour; disadvantaged children.



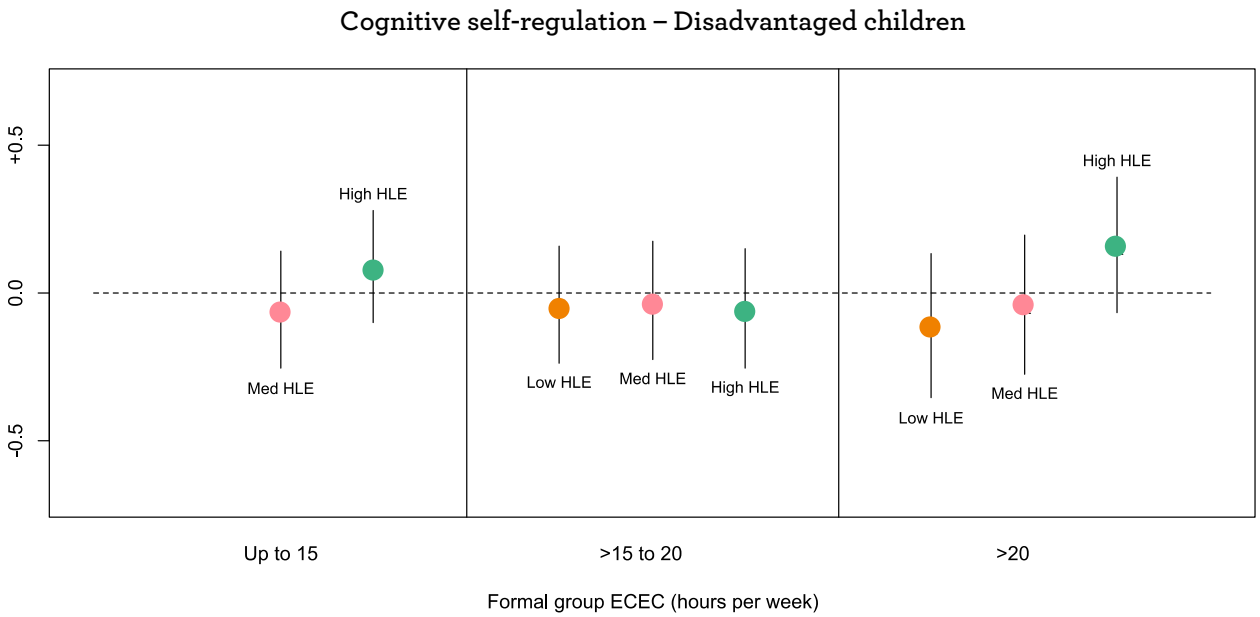
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 34: Graphical summary of results for outcome Behavioural self-regulation; disadvantaged children.



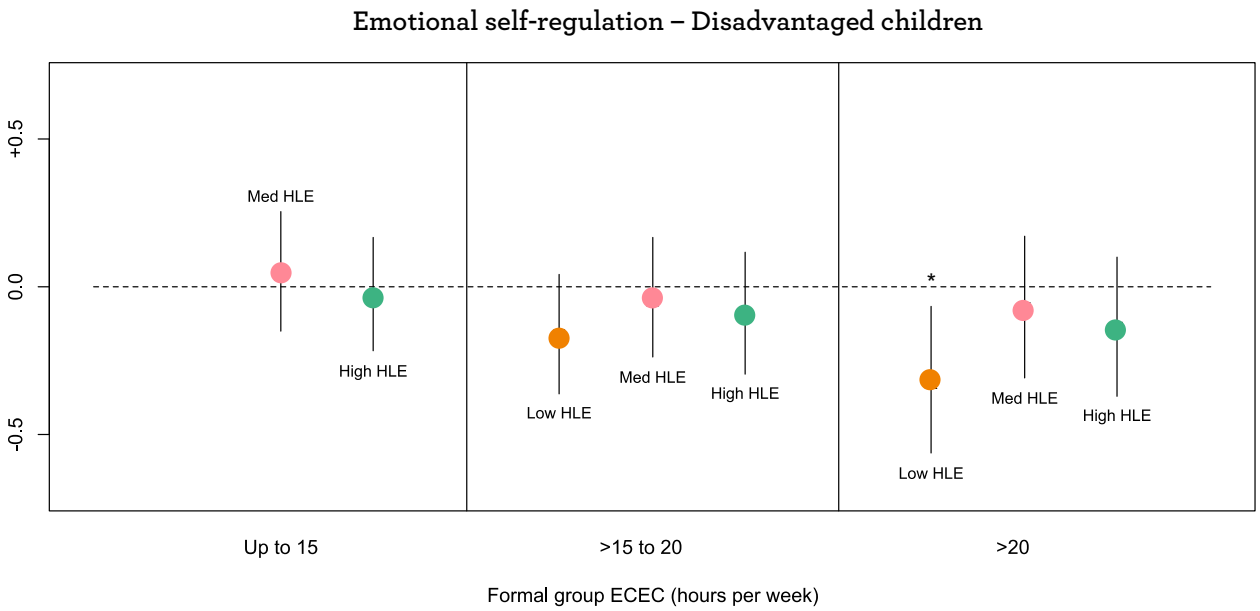
The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 35: Graphical summary of results for outcome Cognitive self-regulation; disadvantaged children.



The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Figure 36: Graphical summary of results for outcome Emotional self-regulation; disadvantaged children.



The up to 15 how Formal group ECEC / low HLE children act as the reference group.

Table 14: Results of regression models of child outcomes in terms of a combined Formal group ECEC usage / Home Learning Environment factor: effects for disadvantaged children.

Formal group ECEC (hpw)	Home learning environment	Outcomes								
		BAS verbal score	BAS non-verbal score	Sociability	Externalising behaviour	Internalising behaviour	Prosocial behaviour	Behavioural self-regulation	Cognitive self-regulation	Emotional self-regulation
Up to 15	Up to 27	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.	Ref. lev.
	>27 to 33	+0.081	-0.171	-0.210*	+0.019	+0.040	-0.044	+0.036	-0.058	+0.051
	>33	+0.337***	+0.157	-0.156	+0.008	+0.099	+0.022	+0.061	+0.090	-0.026
>15 to 20	Up to 27	+0.122	-0.037	-0.196	+0.173	+0.191	-0.137	-0.168	-0.039	-0.160
	>27 to 33	+0.190*	-0.030	-0.128	+0.120	+0.011	-0.076	-0.092	-0.025	-0.037
	>33	+0.314***	+0.133	-0.213*	+0.074	+0.142	-0.077	+0.006	-0.051	-0.088
>20	Up to 27	+0.178	-0.065	-0.313*	+0.338**	+0.214	-0.180	-0.184	-0.111	-0.314*
	>27 to 33	+0.148	-0.104	-0.085	+0.105	+0.062	-0.041	-0.066	-0.041	-0.070
	>33	+0.243*	-0.141	-0.117	+0.201	+0.106	+0.050	+0.000	+0.161	-0.135

Sample size = 2778 (cognitive outcomes) = 2261 (socio-emotional outcomes)
Standardized model coefficients Beta are tabulated.
Statistically significant results are highlighted in pink: * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

The Home Learning Environment - Discussion

Effect of HLE in initial models

Higher HLE scores were associated with better BAS verbal scores at age 5 for both disadvantaged and least disadvantaged children. For the disadvantaged children, higher HLE scores were associated with better Behavioural self-regulation at age 5. For the least disadvantaged children, higher HLE scores were associated with poorer outcomes at age 5 for Sociability, Externalising behaviour and Emotional self-regulation.

Cognitive outcomes

These models confirm the associations between higher HLE and better BAS verbal ability at age 5 found for disadvantaged children.

Socio-emotional outcomes

For the outcomes Externalising behaviour, Internalising behaviour and Emotional self-regulation, higher use of Formal group ECEC between age 3 and the start of school was associated with some poorer child outcomes at age 5. There was no direct effect of HLE, but there was a significant interaction between HLE and Formal group ECEC use with an opposite sign to the main effect of Formal group ECEC. This indicates that the deleterious effects of high Formal group ECEC use are reduced when HLE is high.

This is confirmed by the factor models for the outcome Externalizing behaviour and Emotional self-regulation, where there is a deleterious effect only where Formal group ECEC is high and HLE is low. The pattern is similar for Internalising behaviour although not significant. A similar pattern is found for Sociability, although all children tend to have poorer outcomes than the Low HLE / Low Formal group ECEC reference group.

Conclusion

Higher family HLE is associated with better child verbal ability at age 5 for all children. For the disadvantaged children, HLE had benefits for Behavioural self-regulation at age 5. Also higher HLE may help to prevent poorer socio-emotional outcomes that may be associated with high Formal group ECEC use between age 3 and the start of school. For the least disadvantaged children there was evidence that high HLE was associated with poorer child socio-emotional outcomes for Sociability, Externalising behaviour and Emotional self-regulation. These effects were independent of children's Formal group ECEC use. A possible explanation of these unexpected results is that a rich home learning environment may be associated with an increase in attention seeking behaviour for some less disadvantaged children.

The change in Externalising behaviour between ages 3 and 5

Key Findings

- Children's Externalising behaviour increases on average between ages 3 and 5.
- This overall increase is mainly driven by increases in Externalising behaviour among children with low Externalising behaviour at age 3.
- There is a stronger tendency for Externalising behaviour to increase between ages 3 and 5 for disadvantaged children, and there is a stronger association between high Formal group ECEC use (20+ hours/week) between age 3 and the start of school and high age 5 Externalising behaviour in this group.

Introduction

Teacher assessed Externalising behaviour was available from age 3 and age 5. This chapter presents analyses of the change in Externalising behaviour between these ages, and how this change is related to Formal group ECEC use and child disadvantage.

Methods

Externalising behaviour[6] was recorded for children at age 3 on a scale of 1 to 10, and at age 5 Externalising behaviour[7] was recorded on a scale of 5 to 24. Children's teachers carried out both assessments.

Both measures were re-scaled to have a range of 0 to 100, and the change in Externalising behaviour was calculated as:

- Age 5 Externalising behaviour minus Age 3 Externalising behaviour

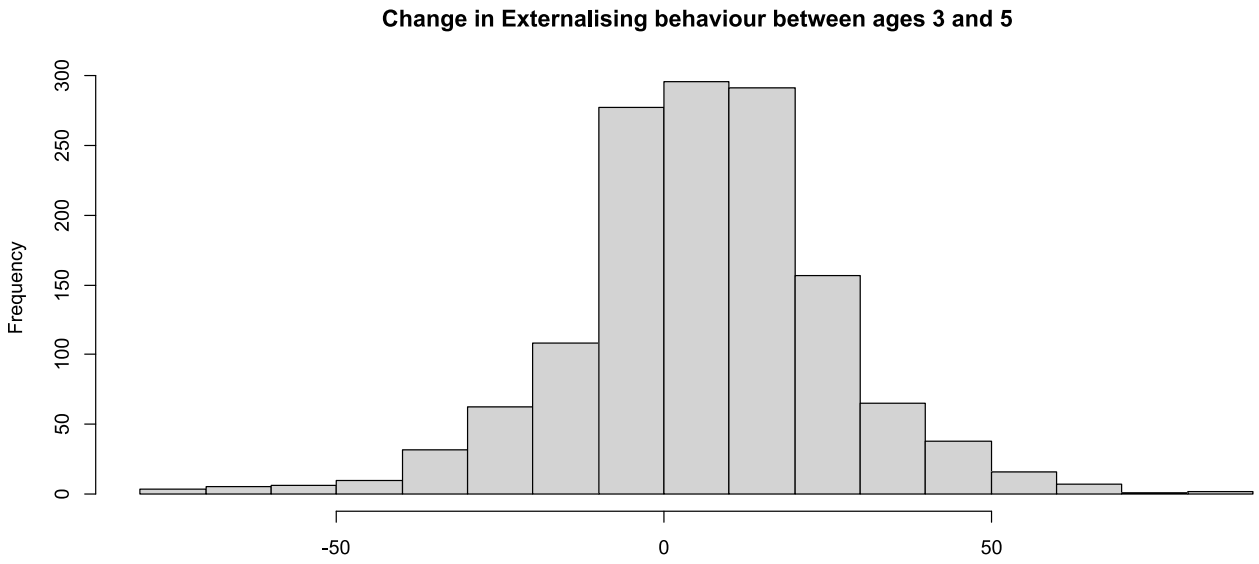
Calculated in this way, values greater than zero indicate an increase in Externalising behaviour between ages 3 and 5, while values less than zero indicate a decrease in Externalising behaviour between ages 3 and 5.

The mean change in Externalising behaviour between age 3 and 5 was calculated, and the mean change in Externalising behaviour was compared between disadvantaged and least disadvantaged children. The relationship between age 3 and age 5 Externalising behaviour was explored using a scatterplot.
A linear regression model of age 5 Externalising behaviour was fitted in terms of age 3 Externalising behaviour and Formal group ECEC use between age 3 and the start of school. Separate effects were fitted for disadvantaged and least disadvantaged children. The model controlled for Formal individual and Informal individual ECEC use, and for home environment and demographic covariates.

[6] From the Strengths and Difficulties Questionnaire (SDQ) conduct problems score.
[7] From the CSBQ.

A histogram of the change in Externalising behaviour between ages 3 and 5 is shown in Figure 37.

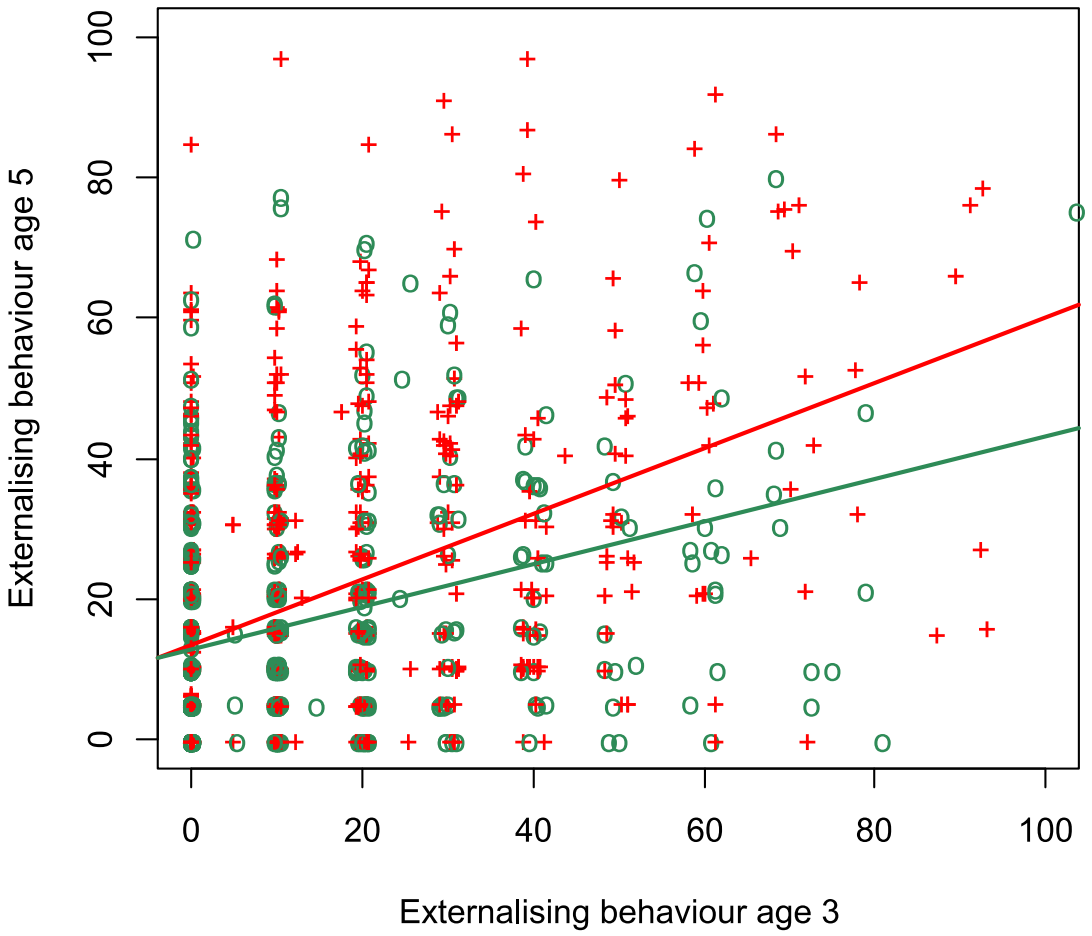
Figure 37: Histogram of change in teacher assessed Externalising behaviour between ages 3 and 5.



The mean value of the change in externalising between age 3 and 5 was 5.86. A t-test showed that this mean was significantly greater than zero ($p < 0.001$), indicating that there was a significant increase in mean teacher assessed Externalising behaviour between ages 3 and 5. The mean increase in Externalising behaviour was 6.24 for the disadvantaged children and 5.38 for the least disadvantaged children; a t-test showed that the difference between the groups was not statistically significant ($p = 0.417$).

A scatterplot of age 5 Externalising behaviour vs. age 3 Externalising behaviour is shown in Figure 38. Regression lines are shown for disadvantaged and least disadvantaged children.

Figure 38: Scatterplot of age 5 externalising behaviour vs. age 3 externalising behaviour.



Note: Points have been jittered* (*random noise has been added to prevent overplotting).
Disadvantaged children: points (+) and regression line in red.
Least disadvantaged children: points (o) and regression line in green.

The results of a linear model of age 5 Externalising behaviour in terms of age 3 Externalising behaviour are given in Table 15.

Table 15: Results of model of age 5 externalising behaviour in terms of age 3 externalising behaviour and Formal group ECEC use from age 3 to start of school.

	Disadvantaged		Least disadvantaged	
	Beta	p-value	Beta	p-value
Age 3 externalising behaviour	+0.717	<0.001***	+0.461	<0.001***
Formal group ECEC	+0.225	0.002**	+0.126	0.109

Sample size = 1225
Statistically significant results are highlighted in pink: * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Discussion

On average, there is an increase in Externalising behaviour between ages 3 and 5. This change is mainly driven by increases in children with low Externalising behaviour at age 3; see Figure 38. For disadvantaged children, there is a stronger association between age 3 and age 5 Externalising behaviour, as well as a stronger association between high Formal group ECEC use between age 3 and the start of school and higher age 5 Externalising behaviour, once age 3 Externalising behaviour has been controlled for (Table 15).

Conclusion

The increase in Externalising behaviour from age 3 to age 5 is largely driven by increased Externalising behaviour in children with low Externalising behaviour at age 3. The increase is larger for disadvantaged children, who show a stronger association between high Formal group ECEC use between age 3 and the start of school and high age 5 Externalising behaviour. This underlines the importance of a good home learning environment for disadvantaged children, which has been seen to be protective against increases in Externalising behaviour that are otherwise associated with high Formal group ECEC use (Chapter 5).

Summary, Conclusions and Policy Implications

This report builds upon the previous reports from the Study of Early Education & Development (SEED; e.g., Melhuish & Gardiner, 2020). It takes analyses of the SEED data further and considers the effects for children's cognitive and socio-emotional development at the start of school (age 5 years) for all children and separately for disadvantaged and less disadvantaged children in terms of:

1. The quantity of Early Childhood Education and Care (ECEC) used between ages 3 and 5 years.
2. The quality of Formal (group) ECEC used.
3. The interaction between quantity and quality of group ECEC.
4. Home Learning Environment (HLE) and the interaction with ECEC use.
5. Externalising behaviour considered in detail because of its policy relevance.

Amount of ECEC

Firstly, analyses considered ECEC usage as a continuous variable with the following results:

Cognitive outcomes

For disadvantaged children, there was an association between higher use of Informal individual ECEC (that is, informal childcare with friends and family) between age 3 and the start of school and better outcomes for verbal ability at age 5. That this was found only for the disadvantaged children may reflect a "saturation effect": that is, the least disadvantaged children tended to have sufficient learning opportunities in any case, and therefore did not derive additional benefit from time in individual childcare. Disadvantaged children may be experiencing a less stimulating home environment and they may receive enhanced one-to one interaction when in informal individual care that enhances language development

Socio-emotional outcomes

For both the disadvantaged and the least disadvantaged children, there were associations between higher use of group ECEC and poorer outcomes on some socio-emotional measures at age 5; specifically, Externalising behaviour, Internalising behaviour, Behavioural self-regulation and Emotional self-regulation.

However, there are differences in the effects associated with ECEC usage for the disadvantaged and least disadvantaged children. The potentially deleterious effects of group ECEC use appeared to be stronger for the least disadvantaged children for Externalising behaviour, Behavioural self-regulation and Emotional self-regulation, whereas for Internalising behaviour the association was stronger for the disadvantaged children.

Subsequently, analyses considered group ECEC usage in terms of narrow (5 hours/week) bands. In these comparisons the 15-20 hours per week group was chosen as the base comparison as it was the largest group, and thus the most typical level of ECEC usage. These models provide additional information on the shape of the associations between the amount of group ECEC used and children's socio-emotional and cognitive outcomes

Cognitive outcomes

Disadvantaged children using up to 5 hours per week group ECEC and those using more than 25 to 30 hours per week group ECEC were likely to have significantly lower non-verbal ability than the 15 to 20 hours per week reference group.

The least disadvantaged children using up to 5 hours per week Formal group ECEC were likely to have significantly higher verbal ability than the 15 to 20 hours per week reference group. The least disadvantaged children using 20 to 25 hours per week group ECEC were likely to have significantly higher non-verbal ability than the 15 to 20 hours per week reference group.

Socio-emotional outcomes

Disadvantaged children using up to 10 hours per week group ECEC were likely to have significantly lower Externalising behaviour than the 15 to 20 hours per week reference group. Disadvantaged children using 5 to 10 hours per week group ECEC were likely to have significantly higher Behavioural self-regulation, and Emotional self-regulation, than the 15 to 20 hours per week reference group.

The least disadvantaged children using 25 to 30 and over 35 hours per week group ECEC were likely to have significantly higher Externalising behaviour than the 15 to 20 hours per week reference group; they were also likely to have significantly lower Emotional self-regulation than the reference group. The least disadvantaged children using over 35 hours per week group ECEC were likely to have significantly higher Internalising behaviour than the 15 to 20 hours per week reference group.

Quality of ECEC

Cognitive outcomes

For all children, there were significant associations found between attending higher quality group ECEC between ages 2 and 4 and better non-verbal ability.

Socio-emotional outcomes

There were no statistically significant associations between ECEC quality and the socio-emotional outcomes for the least disadvantaged children. However, for the disadvantaged children, there were a number of associations between attending higher quality group ECEC between ages 2 and 4 and better socio-emotional outcomes at age 5. Measures of group ECEC quality were associated with child Sociability, Prosocial behaviour, Behavioural self-regulation, Cognitive self-regulation and Emotional self-regulation.

Thus, ECEC quality for disadvantaged children is likely to be of importance for socio-emotional development. The absence of similar associations for the least disadvantaged children may be another example of a “saturation effect”, where the least disadvantaged children tended to have access to developmentally enhancing situations outside of group ECEC, so were less dependent on ECEC for enhancing their development.

Interaction of quantity and quality

Cognitive Development

Disadvantaged children showed better non-verbal ability associated with receiving up to 10 hours per week of high quality group ECEC as compared to those receiving a low quantity of low quality ECEC.

For the least disadvantaged children, there was evidence of benefits for non-verbal ability from high quality group ECEC at all levels of usage and this association was statistically significant for both low and high duration, and in a similar direction for moderate duration.

Socio-emotional development

For disadvantaged children the outcomes Sociability and Behavioural self-regulation showed significant improvements associated with a low quantity of high quality group ECEC as compared to those receiving a low quantity of low quality ECEC.

The least disadvantaged children showed a mixed pattern of results. Some negative effects for socio-emotional development were associated with high quality ECEC for high duration. This occurred for Externalising behaviour, Behavioural self-regulation and Emotional self-regulation. However, for Sociability and Prosocial behaviour low and moderate amounts of high quality ECEC, and high amounts of low quality ECEC were likely to be beneficial.

The Home Learning environment (HLE)

Cognitive Outcomes

Higher Home Learning Environment (HLE) scores were associated with better verbal ability at age 5 for both disadvantaged and least disadvantaged children.

Socio-emotional Outcomes

For disadvantaged children, higher HLE scores were associated with better Behavioural self-regulation at age 5. Also for disadvantaged children, higher HLE scores may help to prevent the poorer age 5 socio-emotional outcomes that are otherwise associated with high group ECEC use between age 3 and the start of school. For the outcomes Externalising behaviour, Internalising behaviour and Emotional self-regulation, higher use of group ECEC between age 3 and the start of school was associated with poorer child outcomes at age 5. However, while there was no direct effect of HLE, the deleterious effects of high group ECEC use were less likely when HLE use was high. This is confirmed in analyses showing that there was a deleterious effect for Externalising behaviour and Emotional self-regulation only where group ECEC was high and HLE was low The pattern is similar for Internalising behaviour although for this outcome the effects fall short of statistical significance.

For the least disadvantaged children there was evidence that high HLE was associated with poorer child socio-emotional outcomes for Sociability, Externalising behaviour and Emotional self-regulation. These effects were independent of children's group ECEC use. A possible explanation of these unexpected results is that a rich home learning environment may be associated with an increase in attention seeking

behaviour for some less disadvantaged children, possibly reflecting the behaviour of children who have previously had large amounts of attention from their parents.

Externalising Behaviour

One potential concern of expanding funded early years provision is any negative impact that longer hours could have on children's behaviour. Given this, further analysis considering the change in Externalising behaviour from age 3 to age 5 were undertaken.

Overall, children's Externalising behaviour increased between ages 3 and 5. This change was largely driven by increased Externalising behaviour at age 5 in children with low Externalising behaviour at age 3, i.e., children moving from low levels to moderate levels of Externalising behaviour.

The increase in Externalising behaviour tended to be larger for disadvantaged children who also showed a stronger association between higher group ECEC use between age 3 and the start of school and a greater increase in Externalising behaviour. This finding is illuminated by the analyses of the interaction of quantity and quality of group ECEC. These interaction analyses indicate that, for disadvantaged children, high levels of group ECEC were only significantly associated with increased Externalising behaviour when the ECEC was of low quality, and not if the ECEC was of high quality. For disadvantaged children having high quality ECEC is likely to be much more important than for less disadvantaged children.

Additionally, the findings on the Home Learning Environment (HLE) underline the importance of a good Home Learning Environment (HLE) for disadvantaged children, which is likely to be protective against increases in Externalising behaviour that are otherwise associated with high usage of low quality group ECEC.

Policy Implications

In conclusion, the relationship between children's development between ages 3 and 5 and children's exposure to ECEC is complex, and differs substantially for children from disadvantaged families and for their less disadvantaged peers. ECEC effects tend to be stronger and more consistent for disadvantaged children. It is possible that differences associated with group ECEC between disadvantaged and least disadvantaged groups may partly reflect the greater use of private sector ECEC by the least disadvantaged and the greater use of maintained ECEC by the disadvantaged group.

For children from families in the lowest 40% of the income distribution – disadvantaged group – there are likely benefits for cognitive development associated with ECEC usage between the ages of 3 and 5 years. These benefits are on average substantially greater if the ECEC is of high quality. There are some socio-emotional benefits but also some socio-emotional drawbacks linked with ECEC usage. The drawbacks largely concern Externalising (or antisocial) behaviour and these drawbacks were not identified with disadvantaged children if the ECEC was of high quality. Also, increases in Externalising behaviour between ages 3 and 5 depends upon children's experience up to age 3 and the consequent level of Externalising behaviour at that age, in that most increase occurred for children with low levels of Externalising behaviour at age 3 moving up to moderate levels. Any increase was less likely if the Home Learning environment (HLE) was high. Thus, further policy attention to the first 3 years is recommended, with a focus on the Home Learning Environment and ECEC for 0-3 years.

Hence, offering higher Externalising behaviour resulting from higher levels of ECEC as a reason for excluding disadvantaged families from the entitlement to 30 hours ECEC is not relevant if the ECEC is of high quality. Governments should prioritise ensuring that all disadvantaged children have access to high quality ECEC. There will be little extra benefit of ECEC of greater duration than the typical usage of 15-20 hours per week, but if the ECEC is of high quality, there need be no further adverse effects for disadvantaged children. The higher levels of ECEC will help parents participate more in the labour market with benefits for their level of affluence as well as for the economy in general.

For the children of families in the upper 60% of the income distribution – the least disadvantaged – ECEC is rather less important than for the disadvantaged children. The associations with ECEC were mixed, with both positive and negative associations.

Also, an earlier SEED report (Melhuish & Gardiner, 2020) reported that, where a high level of ECEC included a mix of individual and group ECEC, then negative effect linked to externalising behaviour was reduced as compared with those receiving just group ECEC. As both individual and group ECEC are eligible for state funding, encouraging a mix of individual and group ECEC where usage is high would seem to be a good idea. In addition, earlier research (Melhuish et al., 2008a) found that disadvantaged children improved more in their development when attending ECEC where other children were from mixed backgrounds rather than from homogenous disadvantaged backgrounds. This probably is the result of peer influence operating both for children and parents. Hence, fostering mixed intakes to ECEC would be beneficial.

The consistently positive effects associated with higher quality ECEC indicate that future policy should seek to foster improvements in the quality of ECEC. Additionally, the consistently positive effects for the disadvantaged group of a higher Home Learning Environment (HLE) implies governments should seek to foster better Home Learning Environments. This will involve cultural change and will not occur overnight. However, Increased awareness of the importance of the Home Learning Environment, and how to improve it – amongst policy-makers, practitioners and families – will lead to gradual cultural change.

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