Study of Early Education and Development (SEED): Impact Study on Early Education Use and Child Outcomes up to age seven years

Research brief

October 2021

Edward Melhuish – University of Oxford

Julian Gardner – University of Oxford

Acknowledgements

Table of Contents

List of tables

Summary

Aims and Methods

This report presents findings about children and families who took part in the Study of Early Education and Development (SEED) longitudinal study. Data on children's use of early childhood education and care (ECEC) and on families' demographic and home environment backgrounds were collected via parental interviews when children were aged two, three and four years old.

For this particular report, children's outcomes were measured in terms of academic attainment in school Year 1 (age 6) and Year 2 (age 7), assessed using the Phonics Screening Check in Year 1 and the Key Stage 1 assessments in school Year 2.

ECEC quality was measured through observations carried out in 1,000 settings attended by a subsample of children in the study.

This report explores whether children's academic attainment during school years 1 to 2 is associated with:

- The amount of differing types of ECEC that children received between age two and the start of school.

- The quality of the ECEC settings that children attended between ages two and four.

- The age at which children first received at least ten hours per week of formal ECEC.

- The early years home environment and the quality of the parent/child relationship at ages two to four.

Key Findings

- Attending higher quality ECEC in nursery classes, nursery schools or playgroups between ages 2 and 4 was associated with better academic results for Key Stage 1 Maths, Key Stage 1 Science and for a combined Key Stage 1 English and Maths outcome during school Year 2. At age 5, EYFSP data did not reveal statistically significant findings for quality of ECEC. Possibly the differences between SEED age 5 and age 7 results reflect the differences between the direct child assessments of Key Stage 1 (age 7), and the teacher ratings of EYFSP (age 5), with direct child assessments (e.g., Key Stage 1) providing better discrimination.

- Children from the 40% most disadvantaged families who started using at least 10 hours per week ECEC before age 2 in nursery classes / schools, playgroups or with childminders, and who went on to attend for at least 20 hours per week between age 2 and the start of school, had better outcomes on Key Stage 1 Reading, Writing and Science and on the Phonics check than children who had never attended such childcare for 10 or more hours per week. This finding is in line with age 5 findings from the EYFSP and assessments of child verbal ability in school Year 1.

- The amount of early childhood education and care (ECEC) which children received between age 2 and the start of school was not associated with their Key Stage 1 academic outcomes or the results of the school Year 1 Phonics check. Please note that only 19 children in the sample (0.5%) had no ECEC before the start of school, therefore the models presented in the analyses assess the effects associated with variation in amount of ECEC, they do not assess the effect of receiving ECEC or not

- Higher Home Learning Environment scores were associated with children performing better on all Key Stage 1 outcomes and on the Phonics check.

- Higher Permissive Parenting scored were associated with poorer child performance on the Key Stage 1 outcomes.

- Higher Parental Limit Setting scores were associated with better outcomes for Key Stage 1 Reading, Maths and Science.

- Higher scores for Warmth in the parent / child relationship were associated with better child outcomes for KS1 Reading, Maths and Science and on the Phonics check.

- Comparisons of the findings from the earlier Effective Pre-school, Primary & Secondary Education (EPPSE) and the Study of Early Education & Development (SEED) indicate the levelling up of children's ECEC experiences across the last two decades. Here, levelling up refers to the fact that there is near universal use of ECEC now, and that there has been an increase in overall ECEC quality with a

reduction in the amount of poor quality ECEC, so children's ECEC experiences across the population are now more equivalent than two decades earlier. A consequence of this levelling up of ECEC experiences is that any effects of ECEC differences upon child development are likely to be reduced.

Introduction

Several decades of research indicate that early childhood education and care (ECEC) can have a positive effect on the educational, cognitive, behavioural and social outcomes of children, in both the short and long term, particularly if it was of good quality (Sylva et al., 2010; Melhuish et al., 2015). From September 2004, all three- and four-year-olds in England have been entitled to some funded early education. Since September 2010 this entitlement for all three- and four-year-olds in England was for 570 hours per year (commonly taken as 15 hours per week for 38 weeks of the year). From September 2017 the entitlement was doubled to 1140 hours per year (equivalent to 30 hours per week for 38 weeks of the year) for families where parents are each earning at least the equivalent of the National Minimum Wage or Living Wage for 16 hours per week.

Research has shown that the benefits of high-quality early education exist even when it starts as young as two years of age (Sammons et al., 2002; Smith et al., 2009). In 2013 the UK Government expanded the funded early education entitlement to two-year-old children living in certain disadvantaged households in England. Specifically, from September 2013 the entitlement was introduced for two-year-olds looked after by the local authority and those from families in receipt of specified benefits, who might be regarded as the most disadvantaged. It was further extended in September 2014 to two-year-olds from low-income families, two-year-olds with special needs and two-year-olds who have left care.

The Study of Early Education and Development (SEED) includes a major longitudinal study designed to provide evidence on the effectiveness of early years education and to identify any short- and longer-term benefits from this investment. The study is conducted by a consortium including the National Centre for Social Research, the University of Oxford, Action for Children and Frontier Economics. SEED aims to study children at age two, three, four, five and seven years to seek information on how variation in ECEC experience may be associated with cognitive and socio-emotional development. This report focuses on how ECEC may be related to children's development up to the end of Key Stage 1, with the objectives:

1. To study the associations between the amounts of different types of ECEC that children received between the age of two and the start of school and child development at Key Stage 1.

2. To study the associations between the quality of the ECEC group settings that children have attended aged two to four and child development at Key Stage 1.

3. To consider how the age of starting formal ECEC may be associated with child development at Key Stage 1.

4. To investigate the impact of the home environment, parenting and the quality of the parent/child relationship on development at Key Stage 1.

Method

Sample

In this report, two samples of SEED children are examined:

1. The 4,879 SEED children with data from the Key Stage 1 Phonics check.

2. The 4,868 SEED children with data from the Key Stage 1 assessment.

Early Childhood Education and Care (ECEC)

In this study, ECEC settings eligible for government funding were classified as 'formal'; those not eligible for government funding were classified as 'informal'. Settings in a non-domestic setting were classified as 'group', whilst those in a domestic setting were classified as 'individual'. The following three-way classification is used in this report:

1. **Formal group ECEC** – ECEC in a non-domestic setting and eligible for government funding (e.g., day nurseries, nursery classes or 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., relatives, friends, neighbours and nannies).

Child development measures

Phonics Screening Check

All children in government-maintained schools in England are required to take a Phonics Screening Check in school Year 1. Children who do not achieve the expected standard re-take the test in school Year 2. Whether or not children achieve the expected standard in the Phonics Screening Check is used as an outcome measure in this report.

Key Stage 1 assessment

All children in government-maintained schools in England take a series of Key Stage 1 (KS1) assessments during school year 2.

Results were available for KS1 Reading, Writing, Maths and Science. The following six outcomes measures were derived from the KS1 assessment.

1. Achieved expected level in KS1 Reading.

2. Achieved expected level in KS1 Writing.

3. Achieved expected level in KS1 Maths.

4. Achieved expected level in KS1 Science.

5. Achieved expected level in KS1 Reading, Writing and Maths.

6. Achieved expected level in all KS1 subjects.

ECEC quality measures

Researchers assessed the quality of 1,000 ECEC settings attended by the SEED children: 402 settings attended at age two, and 598 settings attended at age three.

At age two (Wave 1), setting quality was assessed using:

1. Sustained Shared Thinking and Emotional Well-being (SSTEW) scale – measuring the quality of staff / child interaction.

2. Infant and Toddler Environment Rating Scale – Revised (ITERS-R) – an overall measure of quality for under-threes (e.g., activities, interactions, routines).

At age three (Wave 2) setting quality was assessed using:

1. SSTEW – measuring the quality of staff / child interaction.

2. Early Childhood Environment Rating Scale – Revised (ECERS-R) – an overall measure of quality for over-threes (e.g., activities, interactions, routines).

3. Early Childhood Environment Rating Scale – Extended (ECERS-E) – an extension of ECERS-R focussing on aspects of educational and learning opportunities.

Home environment measures

Nine home environment measures were included in the analyses. These were derived from the SEED Wave 1, Wave 2 and Wave 3 interviews:

1. Home Learning Environment (HLE) index (learning activities in home: e.g., parents read with child, take child to library etc.)

2. Household Disorder (CHAOS scale: e.g., house is noisy, house is disorganised).

3. Parent's Psychological Distress (e.g., symptoms of depression or anxiety).

4. Limit Setting (i.e., how often parents set limits on their child's behaviour).

5. MORS Warmth (closeness in the parent/child relationship: e.g., relationship is affectionate, parent and child do things together). [1]

6. MORS Invasiveness (conflict in the parent/child relationship: e.g., parent finds child annoying).[1]

7. Authoritative parenting, characterized by high demands / high responsiveness.[2]

8. Authoritarian parenting, characterized by high demands / low responsiveness. [2]

9. Permissive parenting, characterized by low demands / high responsiveness.[2]

Where measures were available from multiple waves, the mean value was taken.

Demographic measures

Models were also controlled for demographic variables. 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. Child's month of birth / age in school year.

2. Child's gender.

3. Child's ethnic group.

4. Child's birth weight.

5. Maternal age at birth of child.

6. Number of siblings living in the same household as child.

7. Whether child was living in a couple or lone parent household.

8. Whether child was living in a workless or working household.

9. Household income.

---

[1] See Simkiss et. Al. 2013.
[2] See Robinson 1995.

10. Area Deprivation (Index of Multiple Deprivation, IMD).[3]

11. SEED disadvantage group (most disadvantaged, moderately disadvantaged, least disadvantaged) according to household income and benefits at baseline.

12. Type of accommodation tenure (renting / owner occupier).

13. Mother's highest academic qualification.

14. Father's highest academic qualification.

15. Highest parental socio-economic status.

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

---

[3] A measure which ranks every small area (average 1,500 residents) in England from most to least deprived (based on income deprivation, employment deprivation, education, skills and training deprivation, health deprivation and disability, crime, barriers to housing and services, living environment deprivation).

Results

Statistically significant effects

An effect in a statistical model is described as statistically significant if it is unlikely to have come about by chance. Statistically significance is measured using p-values. By convention, results are considered to be statistically significant if the associated p-value is 5% or less. Where the associated p-value is between 5 and 10%, effects are described as of borderline statistical significance. Such effects need to be regarded with some caution. However, where a pattern of effects of borderline statistical significance occur in these analyses, such results have been used to draw conclusions.

Is the amount and type of ECEC associated with child development?

Models of the child outcomes were fitted in terms of the amount of ECEC which children had used between age 2 and the start of school. ECEC use was considered in three categories: formal group ECEC, formal individual (childminder) ECEC and informal individual ECEC. Models were controlled for demographic and home environment covariates.

Table 1: Results of models of outcome variables in terms of the amount of ECEC used between age 2 and the start of school

Outcome	Formal group Effect	Formal group p-value	Formal individual Effect	Formal individual p-value	Informal individual Effect	Informal individual p-value
KS1 Reading	1.008	0.891	1.003	0.972	0.966	0.551
KS1 Writing	1.024	0.647	1.069	0.439	1.007	0.891
KS1 Maths	1.027	0.655	0.924	0.367	0.955	0.426
KS1 Science	1.067	0.342	1.085	0.475	0.998	0.976
KS1 English / Maths	1.002	0.976	0.944	0.456	1.006	0.909
KS1 All Subjects	1.004	0.935	0.953	0.532	1.009	0.860
Phonics (pass/fail)	0.962	0.685	1.071	0.689	0.980	0.830

Sample size N = 4868.[4]

The effects reported are odds ratios showing the change in the probability of achieving the expected level corresponding to a change in ECEC usage of 10 hours per week. Odds ratios greater than one indicate an increased probability of achieving the expected level; odds ratios less than one indicate a reduced probability of achieving the expected level.

There were no significant or borderline significant associations found between the amount of formal group ECEC, formal individual ECEC or informal individual ECEC used between age 2 and the start of school and children's Phonics and Key Stage 1 outcomes during school years 1 to 2 (see Table 1). This is probably partly attributable to the relative insensitivity of the binary outcomes available here as compared with continuous outcome measures.[5] This failure to find associations between the amount of ECEC use between age 2 and the start of school and children's academic outcomes is consistent with the results for children's Early Years Foundation Stage Profile outcomes from the SEED age 5 report.

Is the quality of ECEC associated with child development?

Because of the intensive nature of the quality observational assessments, a subsample of all settings attended by children in the study was selected for this component. At Wave 1, the quality of 402 settings attended by children at age two to three was assessed. At Wave 2, the quality of 598 settings attended by children at age three was assessed. Because only a subsample of settings was assessed for quality, only a subgroup of the main sample of children was able to be included in the analysis of quality.

The settings for children aged two were assessed using:

- Sustained Shared Thinking and Emotional Well-being Scale (SSTEW). [6]

- Infant and Toddler Environment Rating Scale – Revised (ITERS-R). [7]

The settings for children aged three were assessed using:

- Sustained Shared Thinking and Emotional Well-being Scale (SSTEW).[6]

- Early Childhood Environment Rating Scale – Revised (ECERS-R). [8]

---

[4] The sample size for the Phonics outcome is N = 4879.
[5] A binary measure has just two values, e.g., a pass / fail result in a test. A continuous measure has a full range of values, e.g., the score which a child achieved in a test. Analyses using continuous outcomes are more sensitive, i.e., they are better able to detect associations between the outcome and covariates which may influence the outcome measure.
[6] Siraj, Kingston & Melhuish, 2015.
[7] Harms, Cryer & Clifford, 2006.
[8] Harms, Cryer & Clifford, 2005.

- Early Childhood Environment Rating Scale – Extended (ECERS-E). [9]

The results of the models of the outcome variables in terms of the quality measures are shown in Table 2. Effects which are statistically significant or borderline statistically significant are shown in bold italics.

Table 2: Results of quality models; continuous quality variables.

	KS1 Reading Effect	KS1 Reading p-value	KS1 Writing Effect	KS1 Writing p-value	KS1 Maths Effect	KS1 Maths p-value	KS1 Science Effect	KS1 Science p-value
Wave 1 ITERS-R	0.943	0.810	0.959	0.853	1.275	0.305	1.086	0.755
Wave 1 SSTEW	0.835	0.467	0.949	0.818	1.185	0.483	0.939	0.817
Wave 1 Overall Quality[10]	0.882	0.606	0.953	0.830	1.232	0.381	1.007	0.980
Wave 2 ECERS-R	1.633	0.018*	1.268	0.241	1.481	0.055 (*)	1.662	0.020 *
Wave 2 ECERS-E	1.146	0.523	1.028	0.892	1.249	0.298	1.535	0.069 (*)
Wave 2 SSTEW	1.198	0.399	1.074	0.733	1.201	0.393	1.307	0.241
Wave 2 Overall Quality[11]	1.319	0.190	1.121	0.580	1.318	0.191	1.512	0.067 (*)
Wave 1 and 2 Overall Quality[12]	1.581	0.415	1.465	0.283	2.318	0.024 *	-[1]	

---

[9] Sylva, Siraj-Blatchford & Taggart, 2011.
[10] Overall quality at Wave 1 was defined as the mean of Wave 1 ITERS-R and Wave 1 SSTEW.
[11] Wave 2 Overall Quality was a common factor extracted from Wave 2 ECERS-R, ECERS-E and SSTEW.
[12] Wave 1 and 2 Overall Quality was a common factor extracted from Wave 1 ITERS-R and SSTEW and Wave 2 ECERS-R, ECERS-E and SSTEW.

Sample size N = 577 (Wave 1), = 694 (Wave 2), = 319 (Wave 1 and Wave 2).[13]

Effects are odds ratios showing the change in the probability of a positive outcome corresponding to a change of two standard deviations in the quality covariate. Odds ratios greater than one indicate an increased probability of achieving the expected level; odds ratios less than one indicate a reduced probability of achieving the expected level. Statistically significant coefficients are indicated by stars: (*) = p < 0.1, * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

[1] Insufficient degrees of freedom to report model result.

Table 2 (contd.)

	KS1 English / Maths Effect	KS1 English / Maths p-value	KS1 All Subjects Effect	KS1 All Subjects p-value	Phonics (pass/fail) Effect	Phonics (pass/fail) p-value
Wave 1 ITERS-R	1.089	0.692	1.088	0.693	1.457	0.219
Wave 1 SSTEW	1.040	0.856	1.029	0.897	1.508	0.202
Wave 1 Overall Quality[10]	1.064	0.773	1.058	0.795	1.489	0.201
Wave 2 ECERS-R	1.198	0.348	1.193	0.355	1.541	0.172
Wave 2 ECERS-E	1.003	0.986	1.018	0.929	1.473	0.265
Wave 2 SSTEW	1.052	0.797	1.037	0.854	1.334	0.390
Wave 2 Overall Quality[11]	1.082	0.685	1.080	0.690	1.466	0.249

---

[13] Sample sizes for the Phonics outcome are N = 580 (Wave 1), = 700 (Wave 2), = 323 (Wave 1 and Wave 2).

	KS1 English / Maths Effect	KS1 English / Maths p-value	KS1 All Subjects Effect	KS1 All Subjects p-value	Phonics (pass/fail) Effect	Phonics (pass/fail) p-value
Wave 1 and 2 Overall Quality[12]	1.790	0.091 (*)	1.666	0.136	-[1]	

[1] Non-finite coefficient estimate.

Wave 2 Quality

ECERS-R

Higher levels of Wave 2 ECERS-R quality were associated with an increased probability of achieving the expected level in KS1 Reading, KS1 Maths (borderline significant effect) and in KS1 Science.

ECERS-E

Higher quality on the ECERS-E scale were associated with a higher probability of achieving the expected level in KS1 Science (borderline significant effect).

Wave 2 Overall Quality Measure

Higher quality on the overall Wave 2 quality measure were associated with a higher probability of achieving the expected level in KS1 Science (borderline significant effect).

Wave 1 and 2 Quality

Wave 1 and 2 overall quality

Higher quality on the overall Wave 1 and 2 quality measure was associated with a higher probability of children achieving the expected level in KS1 Maths. Higher quality on the overall Wave 1 and 2 quality measure was also associated with a higher probability of children achieving the expected level in KS1 English / Maths (borderline significant effect).

Attending higher quality formal group ECEC between ages 2 and 4 was associated with better child outcomes in KS1 Reading, KS1 Maths, KS1 Science and with the combined KS1 English and Maths outcome. The beneficial effects of quality are predominantly

associated with the ECERS-R scale — a measure of overall ECEC quality for settings for the over threes — or with composites of the available quality scales, with only one borderline significant effect associated with the ECERS-E quality measure, an extension of the ECERS-R scale which focusses on the specifically educational aspects of ECEC for the over threes. This suggests that the overall quality of childcare which children experience prior to starting school may be more significant for their later academic development than the specifically educational element of the childcare.

The age formal ECEC use starts

The outcome variables were modelled in terms of the age when at least 10 hours per week formal ECEC was first used combined with the mean usage of formal ECEC between age 2 and the start of school; see Table 3.

Table 3: Breakdown of sample by formal ECEC start age/ usage factor

Level name	Age at which ten or more hours per week formal ECEC started	Mean weekly formal ECEC use between age two and start of school	All children		40% most disadvantaged		60% least disadvantaged	
			N	%	N	%	N	%
Never 10+ hours per week	Never		136	3.9	92	4.3	44	3.2
Early start / high use	0-24 months	Over 20 hpw	568	16.1	245	11.4	323	23.4
Early start / low-medium use	0-24 months	Up to 20 hpw	360	10.2	170	7.9	190	13.8
Intermediate start / high use	25-36 months	Over 20 hpw	210	6.0	141	6.6	69	5.0
Intermediate start / low-medium use	25-36 months	Up to 20 hpw	737	20.9	538	25.1	199	14.4
Late start / medium-high use	37-54 months	Over 10 hpw	854	24.2	524	24.4	330	23.9
Late start / low use	37-54 months	Up to 10 hpw	658	18.7	434	20.2	224	16.2

hpw = hours per week

This breakdown is for the sample of N = 4868 who had the KS1 outcomes. The results for the N = 4879 who had the Phonics outcome are very similar.

Because of the difference in the distribution of formal ECEC start age between the 40% most disadvantaged children and the 60% least disadvantaged children, analysis was carried out separately for these groups.

Model results are given in Table 4 (40% most disadvantaged children) and Table 5 (60% least disadvantaged children). Statistically significant and borderline statistically significant effects are shown in bold italics.

Table 4: Results of models of child outcomes in terms of formal ECEC start age / usage factor; 40% most disadvantaged children.

	KS1 Reading Effect	KS1 Reading p-value	KS1 Writing Effect	KS1 Writing p-value	KS1 Maths Effect	KS1 Maths p-value	KS1 Science Effect	KS1 Science p-value
Never 10+ hours per week	Reference		Reference		Reference		Reference	
Early start / high use	1.539	0.082 (*)	1.580	0.069 (*)	1.350	0.199	1.648	0.080 (*)
Early start / low-medium use	1.197	0.517	1.275	0.393	1.357	0.269	1.147	0.669
Intermediate start / high use	1.267	0.370	1.303	0.354	1.318	0.283	1.313	0.351
Intermediate start / low-medium use	1.178	0.473	1.223	0.386	1.200	0.387		- [1]
Late start / medium-high use	1.310	0.244	1.360	0.235	1.262	0.293	1.249	0.452
Late start / low use	1.270	0.302	1.248	0.347	1.340	0.163	1.147	0.625

Sample size N = 3179.[14]

The effect is the difference in the probability of achieving the expected level between a given group and the reference group, expressed as an odds ratio. Odds ratios greater than one indicate an increased probability of achieving the expected level; odds ratios less than one indicate a reduced probability of achieving the expected level. Statistically significant coefficients are indicated by stars: (*) = $p < 0.1$, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

[1] Too few degrees of freedom to report model coefficient.

Table 4 (contd.)

	KS1 English / Maths Effect	KS1 English / Maths p-value	KS1 All Subjects Effect	KS1 All Subjects p-value	Phonics (pass/fail) Effect	Phonics (pass/fail) p-value
Never 10+ hours per week	Reference		Reference		Reference	
Early start / high use	1.427	0.107	1.418	0.112	2.108	0.052 (*)
Early start / low-medium use	1.257	0.370	1.239	0.401	1.489	0.345
Intermediate start / high use	1.401	0.203	1.402	0.205	1.175	0.703
Intermediate start / low-medium use	1.291	0.202	1.273	0.228	1.168	0.592
Late start / medium-high use	1.356	0.159	1.350	0.168	1.552	0.181
Late start / low use	1.360	0.143	1.329	0.179	1.481	0.261

[14] The sample size for the Phonics outcome is N = 3184.

Table 5: Results of models of child outcomes in terms of formal ECEC start age / usage factor; 60% least disadvantaged children.

	KS1 Reading Effect	KS1 Reading p-value	KS1 Writing Effect	KS1 Writing p-value	KS1 Maths Effect	KS1 Maths p-value	KS1 Science Effect	KS1 Science p-value
Never 10+ hours per week	Reference		Reference		Reference		Reference	
Early start / high use	1.056	0.898	1.130	0.766	1.018	0.971	1.499	0.418
Early start / low-medium use	1.388	0.450	1.390	0.447	1.131	0.802	2.019	0.197
Intermediate start / high use	0.993	0.989	0.745	0.541	0.958	0.935	1.096	0.873
Intermediate start / low-medium use	1.385	0.450	1.191	0.664	1.322	0.579	1.549	0.324
Late start / medium-high use	1.052	0.901	1.017	0.967	1.222	0.671	1.232	0.661
Late start / low use	1.044	0.916	1.167	0.710	1.040	0.931	1.409	0.473

Sample size N = 1689.[15]

The effect is the difference in the probability of achieving the expected level between a given group and the reference group, expressed as an odds ratio. Odds ratios greater than one indicate an increased probability of achieving the expected level; odds ratios less than one indicate a reduced probability of achieving the expected level. Statistically significant coefficients are indicated by stars: (*) = p < 0.1, * = p < 0.05, ** = p < 0.01, *** = p< 0.001.

---

[15] The sample size for the Phonics outcome is N = 1695.

Table 5 (contd.)

	KS1 English / Maths Effect	KS1 English / Maths p-value	KS1 All Subjects Effect	KS1 All Subjects p-value	Phonics (pass/fail) Effect	Phonics (pass/fail) p-value
Never 10+ hours per week	Reference		Reference		Reference	
Early start / high use	1.079	0.839	1.064	0.868	1.649	0.534
Early start / low-medium use	1.354	0.446	1.379	0.418	1.332	0.731
Intermediate start / high use	0.760	0.545	0.774	0.572	0.830	0.831
Intermediate start / low-medium use	1.325	0.469	1.335	0.458	0.872	0.851
Late start / medium-high use	1.120	0.755	1.129	0.739	1.013	0.985
Late start / low use	1.075	0.846	1.057	0.881	1.289	0.739

For the 40% most disadvantaged group, children in the early start / high use group had a higher probability than the reference group of achieving the expected level in KS1 Reading, KS1 Writing and KS 1 Science, and a higher probability of achieving a pass in the Phonics Screening Check (Table 4). All results were of borderline statistical significance.

That there are benefits for more disadvantaged children from an early start in formal ECEC is consistent with the results for performance in the Early Years Foundation Profile found in the SEED age 5 report.

Are variations in the home environment associated with child development?

There was considerable evidence for the influence of both the home environment and the quality of the parent/child relationship on the child's cognitive and socio-emotional outcomes.

The results of models of the outcome variables in terms of the home environment covariates are shown in Table 6. Statistically significant and borderline statistically significant effects are shown in bold italics.

Table 6: Summary of the associations between home environment variables and children's outcomes during school years 1 to 2.

	KS1 Reading Effect	KS1 Reading p-value	KS1 Writing Effect	KS1 Writing p-value	KS1 Maths Effect	KS1 Maths p-value	KS1 Science Effect	KS1 Science p-value
Home learning environment	1.435	<0.001***	1.427	<0.001***	1.487	<0.001***	1.460	<0.001***
Household chaos		-		-		-		-
Parent's psychological distress		-		-		-		-
Parental limit setting	1.367	<0.001***		-	1.502	<0.001***	1.433	<0.001***
Parental warmth	1.312	0.001**		-	1.303	0.002**	1.573	<0.001***
Parental invasiveness		-		-	0.790	0.030*	0.803	0.035*
Authoritarian parenting		-		-		-		-
Authoritative parenting		-		-		-		-
Permissive parenting	0.768	0.006**	0.742	0.001**	0.837	0.038*	0.804	0.045*

Sample size N = 4868.[16]

The effects are odds ratio showing the change in the probability of achieving the expected level corresponding to a two standard deviation change in the home environment covariate, controlling for all other model covariates. Odds ratios greater than one indicate an increased probability of achieving the expected level; odds ratios less than one indicate a reduced probability of achieving the expected level. Statistically significant coefficients are indicated by stars: (*) = p < 0.1, * = *p* < .05, ** = *p* < .01, *** = *p* < 0.001.

Table 6 (contd.)

	KS1 English / Maths Effect	KS1 English / Maths p-value	KS1 All Subjects Effect	KS1 All Subjects p-value	Phonics (pass/fail) Effect	Phonics (pass/fail) p-value
Home learning environment	1.420	<0.001***	1.405	<0.001***	1.727	<0.001***
Household chaos		-		-		-
Parent's psychological distress		-		-		-
Parental limit setting		-		-		-
Parental warmth		-		-	1.359	0.013*
Parental invasiveness		-		-		-
Authoritarian parenting		-		-		-
Authoritative parenting		-		-		-
Permissive parenting	0.779	0.004**	0.786	0.005**		-

---

[16] The sample size for the Phonics outcome is N = 4879.

Home learning environment (HLE)

Higher levels of Home Learning Environment were associated with better performance on KS1 Reading, Writing, Maths and Science, KS1 English & Maths, KS1 All Subjects and the Phonics Screening Check.

Household CHAOS

There were no statistically significant associations between household chaos and children's outcomes during school years 1 to 2.

Parent's psychological distress

There were no significant associations between parent's psychological distress and children's outcomes during school years 1 to 2.

PCCT limit setting

Higher levels of parental limit setting were associated with a higher probability of children achieving the expected level in KS1 Reading, Maths and Science.

MORS warmth

Higher levels of warmth in the parent/child relationship were associated with a higher probability of children's achieving the expected level in KS1 Reading, Maths and Science. Higher levels of warmth were also associated with better performance in the Phonics Screening Check.

MORS invasiveness

Higher levels of invasiveness in the parent/child relationship were associated with a lower probability of children's achieving the expected level in KS1 Maths and Science.

PSD authoritarian parenting

There were no statistically significant associations between authoritarian parenting and children's outcomes during school years 1 to 2.

PSD authoritative parenting

There were no statistically significant associations between authoritative parenting and children's outcomes during school years 1 to 2.

PSD permissive parenting

Higher levels of permissive parenting were associated with poorer child outcomes on all KS1 measures.

Home environment factors, including the quality of the parent/child relationship have considerable influence on children's educational outcomes during school years 1 to 2. Given the timing of the measurements, and because an extensive number of factors were controlled for in the analyses, the relationships between home environment and child outcome are assumed to be causal.

The relative influence of home environment and demographic factors

Demographic covariates were significantly associated with all the child outcomes. The effects of demographic outcomes tended to be larger than those of the home environment measures. The largest influence on all the child outcomes analysed was mother's education. Father's education was also a significant influence on certain child outcomes, even once mother's education was controlled for.

Girls had significantly better outcomes on the Phonics check and on all KS1 outcomes except maths. Children who were older in their school year performed better, as did children with higher birth weights. There were also benefits associated with coming from a household with higher socio-economic status, higher income and a household where someone was working. There were negative associations with coming from a disadvantaged family and with coming from a family with three or more siblings.

The effects of home environment and demographic factors on children's academic outcomes show a fair degree of continuity between the age 6 to 7 outcomes considered here and the outcomes considered in earlier waves of the SEED study.

Conclusions

The SEED study has investigated the influence of ECEC upon children's development following a period of substantial change in the UK policy landscape for ECEC. This report focuses on children's academic outcomes in school years 1 and 2. The binary outcomes used limit the sensitivity of the analyses, which may partly account for the lack of associations between the overall amount of ECEC which children used and their academic outcome measures.

However, attending better quality ECEC was associated with better child outcomes. Additionally, an early start to formal ECEC combined with a higher amount of formal ECEC use was associated with better child outcomes for disadvantaged children only.

The home environment proved to be a powerful and consistent influence upon children's outcomes, including the home learning environment, the quality of the parent/child relationship and parental limit setting.

Children's characteristics were influential in that girls did better than boys and children's age in the school year had a substantial effect, with older children doing better. Family characteristics were also important, particularly parental education, with socio-economic status, income and being in a working household all being linked to children's development.

The overall effects for child development associated with differences in ECEC experience found in SEED are somewhat less that those reported in the earlier substantial study, the Effective Pre-school, Primary & Secondary Education (EPPSE). These differences reflect the changes in the ECEC landscape in the UK that have occurred over the last two decades. Compared with twenty years ago, now almost all children attend early childhood education, and the quality of ECEC has improved substantially (Melhuish 2016; Melhuish & Gardiner, 2019), largely through the reduction in the extent of poor quality ECEC, which was more prevalent in earlier decades. Hence, there has been a levelling up in the ECEC experiences of children across the socio-economic spectrum, with less variation in amount, or quality, of ECEC experiences across the population. This can be regarded as a "good news" story as the situation for children now is substantially better than it was at the end of the twentieth century. It is noteworthy that the policy changes leading to these benefits were driven by ground-breaking UK research, which has come to be recognised across the world.

Overall, there is much of interest to policymakers, practitioners and parents in the results deriving from the SEED study.

References

Harms, T., Cryer, D. & Clifford, R. M. (2005). *Early Childhood Environment Rating Scale: Revised Edition.* New York: Teachers College Press.

Harms, T., Cryer, D. & Clifford, R. M. (2006). *Infant Toddler Environment Rating Scale: Revised Edition.* New York: Teachers College Press.

Melhuish, E., Ereky-Stevens, K., Petrogiannis, K., Ariescu, A., Penderi, E., Rentzou, K., Tawell, A., Slot, P., Broekhuizen, M., & Leseman, P. (2015). A review of research on the effects of early childhood Education and Care (ECEC) upon child development. CARE project; Curriculum Quality Analysis and Impact Review of European Early Childhood Education and Care (ECEC). http://ecec-care.org/resources/publications/

Robinson, C. C., Mandleco, B., Olsen, S. F., Hart, C. H. (1995). Authoritative, Authoritarian, and Permissive Parenting Practices: Development of a New Measure, *Psychological Reports* 77(3), 819-830.

Sammons, P., Sylva, K., Melhuish, E., Taggart, B., Elliot, K., & Siraj-Blatchford, I. (2002). *The Effective Provision of Pre-School Education (EPPE) Project: Measuring the impact of pre-school on children's cognitive progress over the pre-school period*. London: Institute of Education, University of London/ Department for Education and Skills.

Simkiss, D. E., et. al. (2013). *Validation of the mothers' object relations scales in 2–4-year-old children and comparison with the child–parent relationship scale.* Health and Quality of Life Outcomes 11: 49. https://doi.org/10.1186/1477-7525-11-49

Siraj, I., Kingston, D., Melhuish, E. (2015). *Assessing Quality in Early Childhood Education and Care. Sustained shared thinking and emotional well-being (SSTEW) scale for 2-5 year olds provision.* London: Trentham Books.

Smith, R., et al. (2009). Early Education Pilot for Two Year Old Children: Evaluation: Research Report DCSF-RR134. London, Department for Children, Schools and Families.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2010). *Early childhood matters: Evidence from the effective pre-school and primary education project*. Oxon: Routledge.

Sylva, K., Siraj-Blatchford, I. & Taggart B. (2011). *ECERS-E The Four Curricular Subscales Extension to the Early Childhood Environment Rating Scale: 4th Edition with Planning Notes.* New York: Teachers College Press.